YANI GAO

Graduation Portfolio | Columbia GSAPP 2021-2022

yg2824@columbia.edu
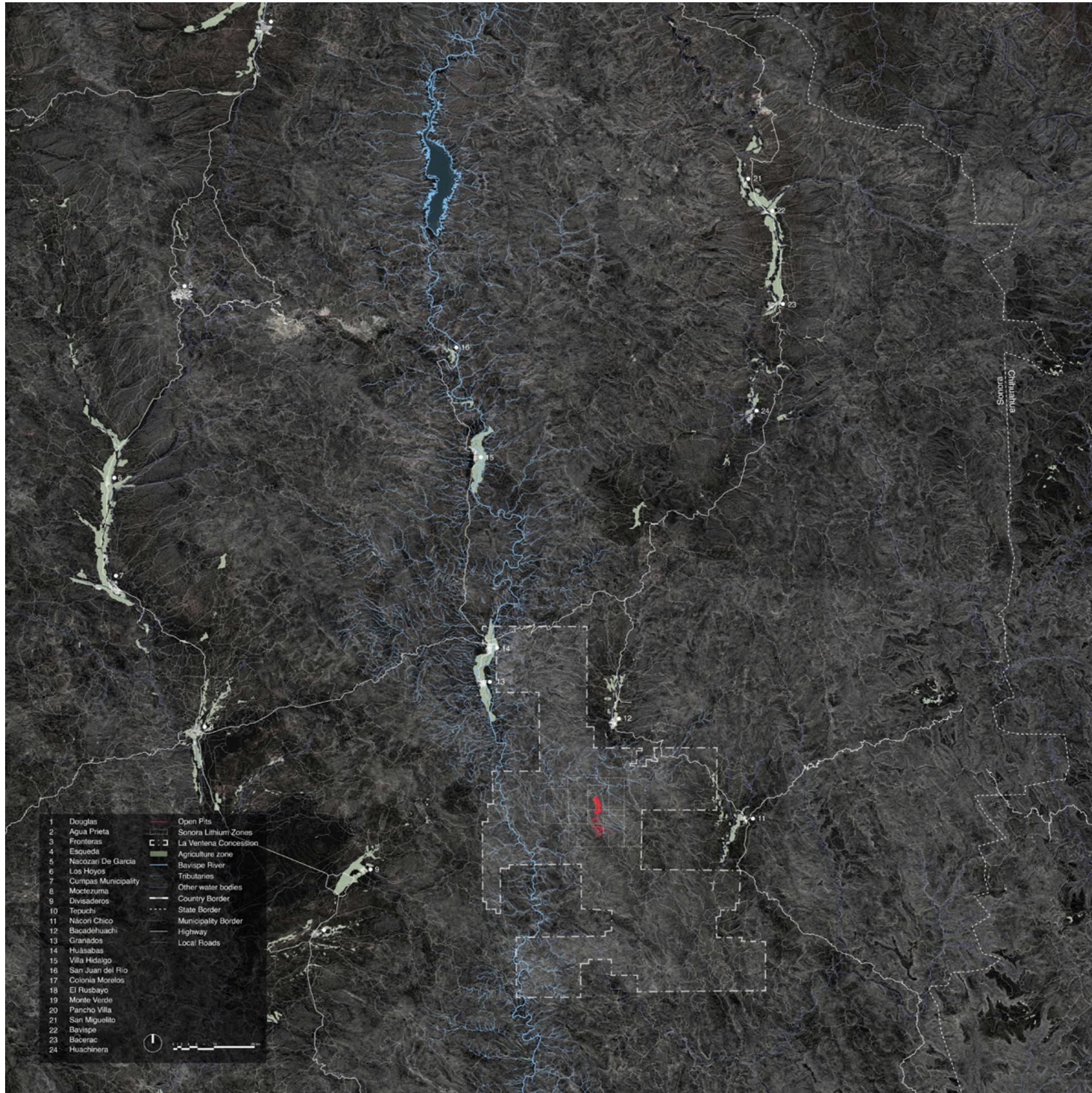
"…how do you drop through a trapdoor and engage the flip side of these logics?"

These projects and writings examine and discuss the extraction, displacement, mistreatment, neglect, and misuse within our current Anthropocene, which is more prevalent than ever currently in 2022. Through an architectural lens, these interdisciplinary research and design aim to lead to a future of personal endeavors and hope to spread discussions to all eyes.

This portfolio contains work of both Advanced Design Studios and electives taken during Summer 2021 to Spring 2022.

CONTENTS

1. Douglas
2. Agua Prieta
3. Fronteras
4. Esqueda
5. Nacozari De Garcia
6. Los Hoyos
7. Cumpas Municipality
8. Moctezuma
9. Divisaderos
10. Tepuchi
11. Nácori Chico
12. Bacadehuachi
13. Granados
14. Huásabas
15. Villa Hidalgo
16. San Juan del Rio
17. Colonia Morelos
18. El Rusbayo
19. Monte Verde
20. Pancho Villa
21. San Miguelito
22. Bavispe
23. Bacerac
24. Huachinera

- Open Pits
- Sonora Lithium Zones
- La Ventana Concession
- Agriculture zone
- Bavispe River
- Tributaries
- Other water bodies
- Country Border
- State Border
- Municipality Border
- Highway
- Local Roads

01

## Lithium and Slow Violence in Sonora, Mexico

AAD Entangled Studio, Summer 2021
Columbia GSAPP
Instructor: Jorge Ambrosi + Gabriela Etchegaray
Site: Sonora Mexico
Team: Yani Gao, Zihan Sun, Irmak Turanli

Lithium, the main component of fast charging, electricity storing lithium-ion batteries, has become the most forthcoming mineral globally. The demand for lithium ore is growing triple folds, responding to our desire to be constantly connected on electronic devices and the worldwide transition to 'green' electric cars. In the hope to lead to a social consciousness of the invisible violence and shorten the distance between us and this industry's productional, environmental and societal impact, we are investigating the processes and relationships from the birthplace of lithium- the mining site.

By drawing the taskscape of a new lithium mine in Sonora, Mexico, we examined the violence brought on by the production of this mineral, which lies hidden behind a facade that the developed world comfortably ignores. A mineral that supposedly helps construct a greener future for us while the burdens are imposed upon the invisible many.

TASKSCAPES OF EXTRACTION NO.1

Mapping of elements: Coal, Crude Oil, Salt, Natural Gas, Stone and Sand Quarry, Silver, Gold, Copper, Zinc, Iron, Lithium. | Networks of interactions, trading routes, industries and processes. | Bars are drawn to represent the value of the mineral (USD/ton).
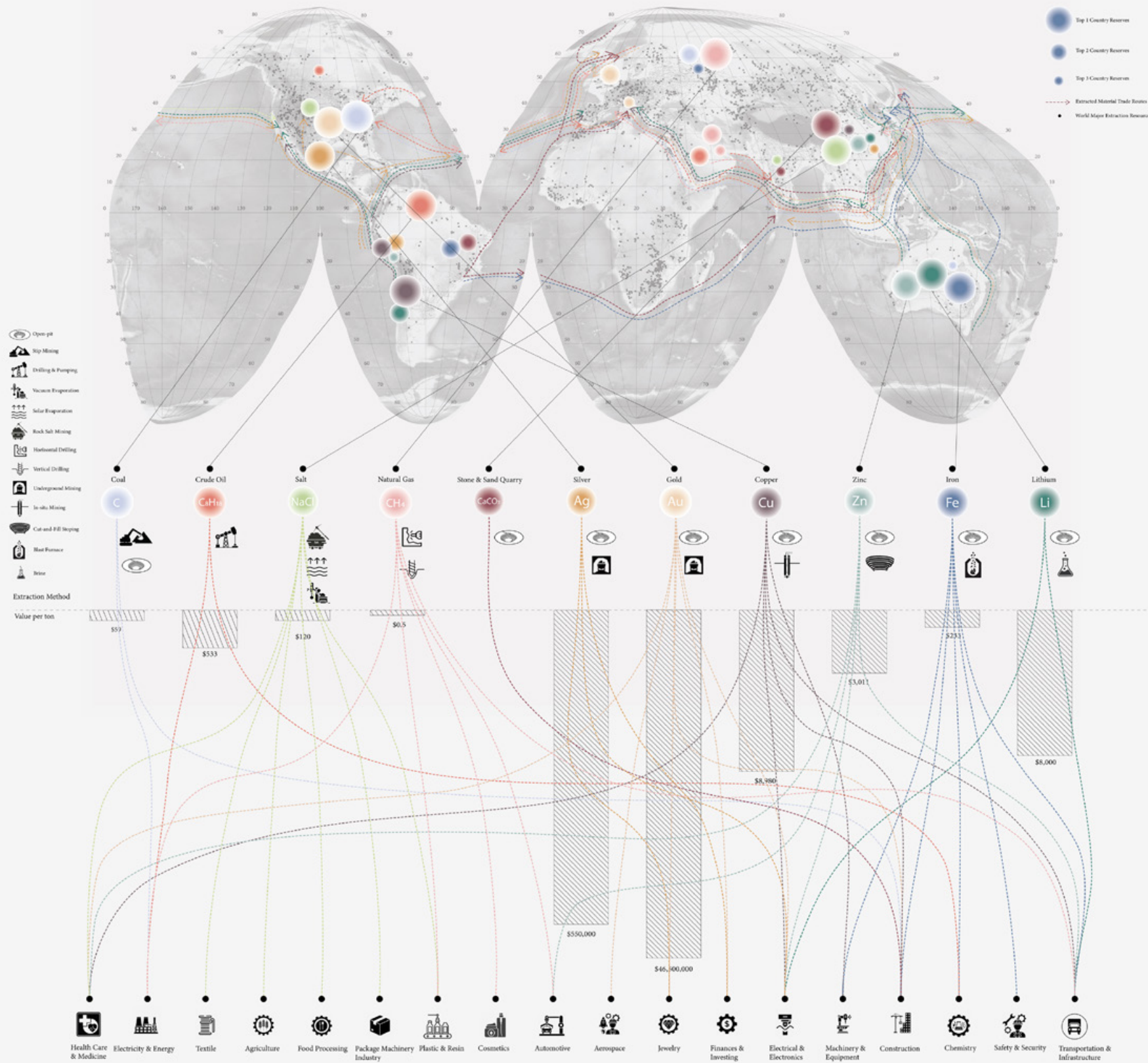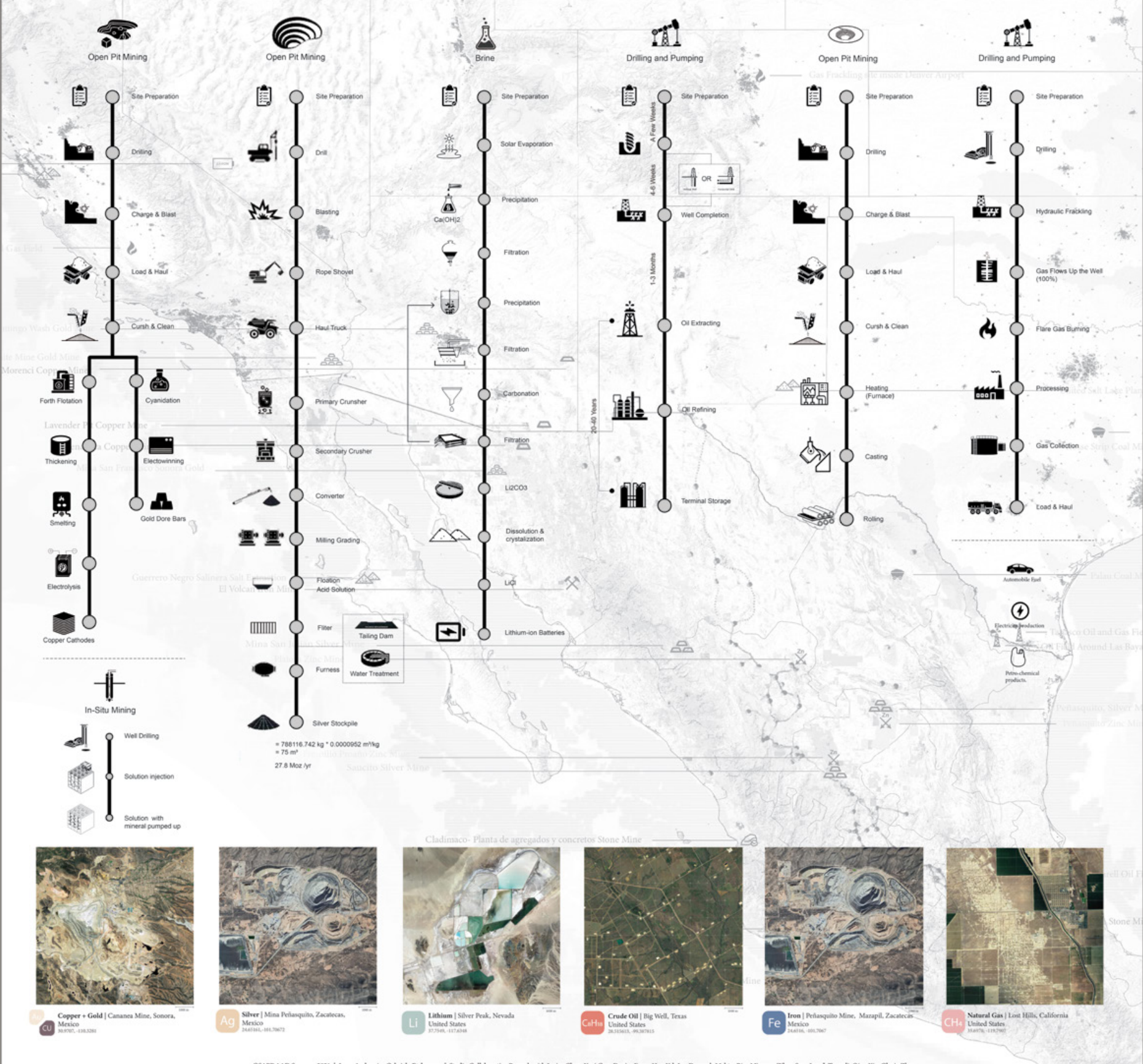

EXTRACTION IN MEXICO & US BORDER

Mapping of elements: Coal, Crude Oil, Salt, Natural Gas, Stone and Sand Quarry, Silver, Gold, Copper, Zinc, Iron, Lithium. | Mapping of infrastructure and network systems. | Extraction sites are called out based on six projects.
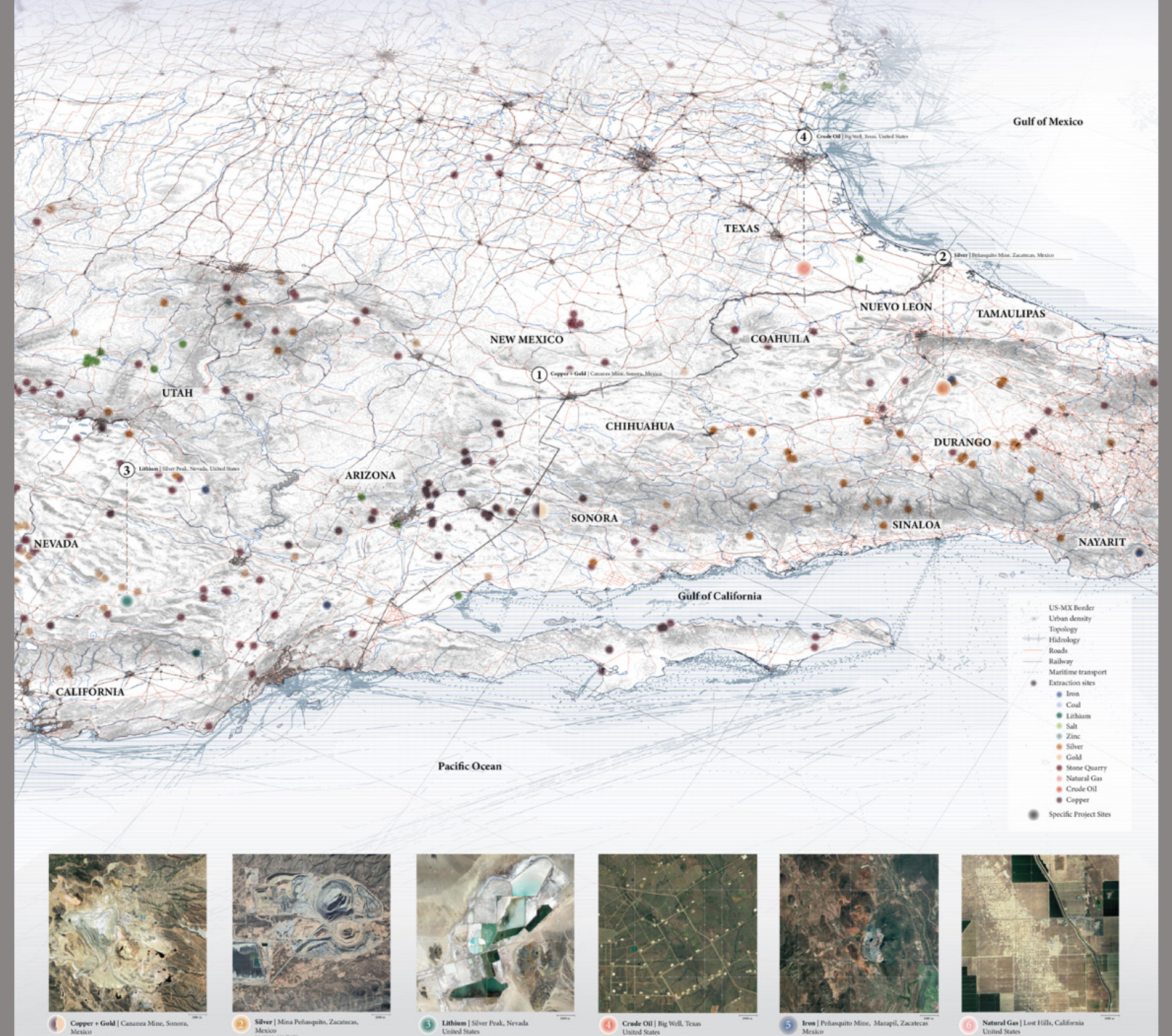
EXTRACTION PROCESS

Extraction process diagrams for six mining sites of Cananea Mine (Copper&Golder), Peñasquito Mine (Silver & Iron), Silver Peak (Lithium), Big Well (Crude Oil), and Lost Hills (Natural Gas).

Metal elements and their products are widely used in aerospace, Jewelry, finances & investing electrical & electronics, machinery & equipment, construction, chemistry, safety & security, and transportation & infrastructure industries.

Among non-metal elements and their products, coal, crude oil, and natural gas are widely used in the electricity & energy industry. Apart from that, they also play a role in health care & medicine, textile, agriculture, food processing, package machinery, plastic & resins, cosmetics, and automotive industries.

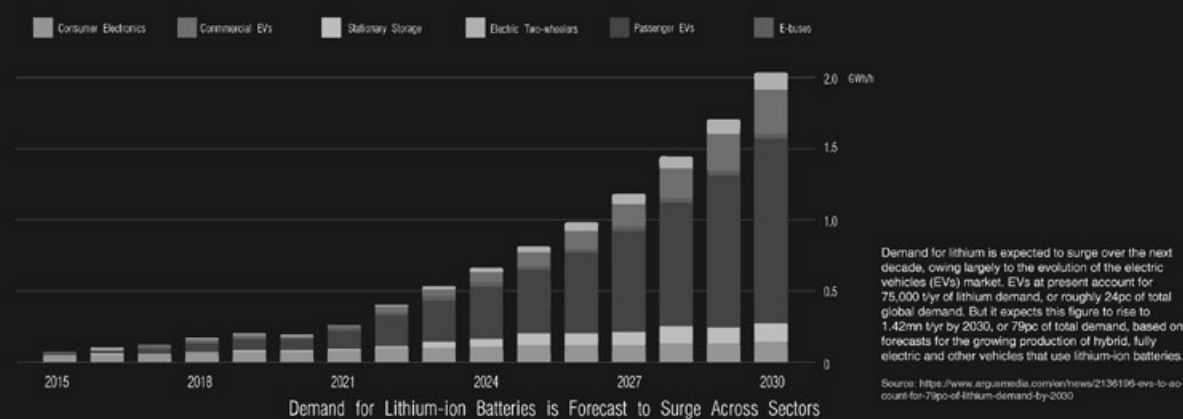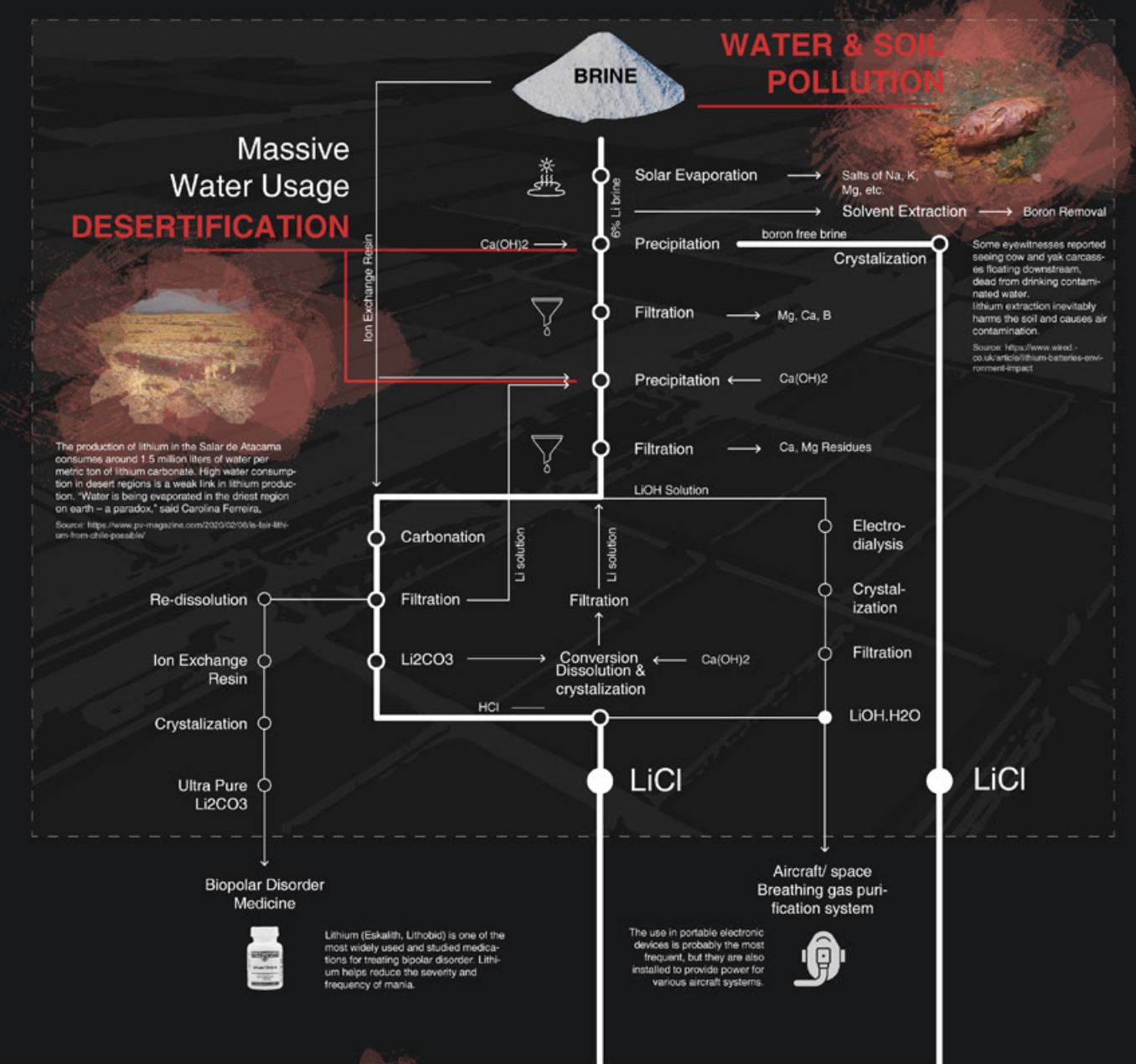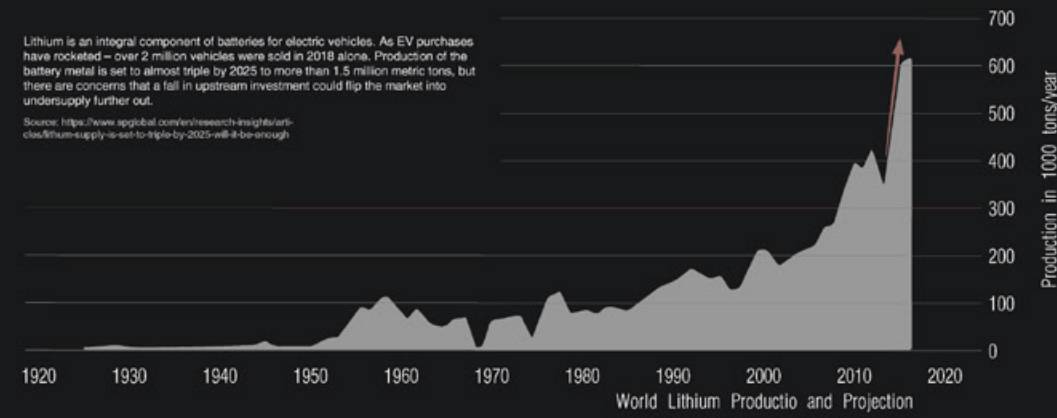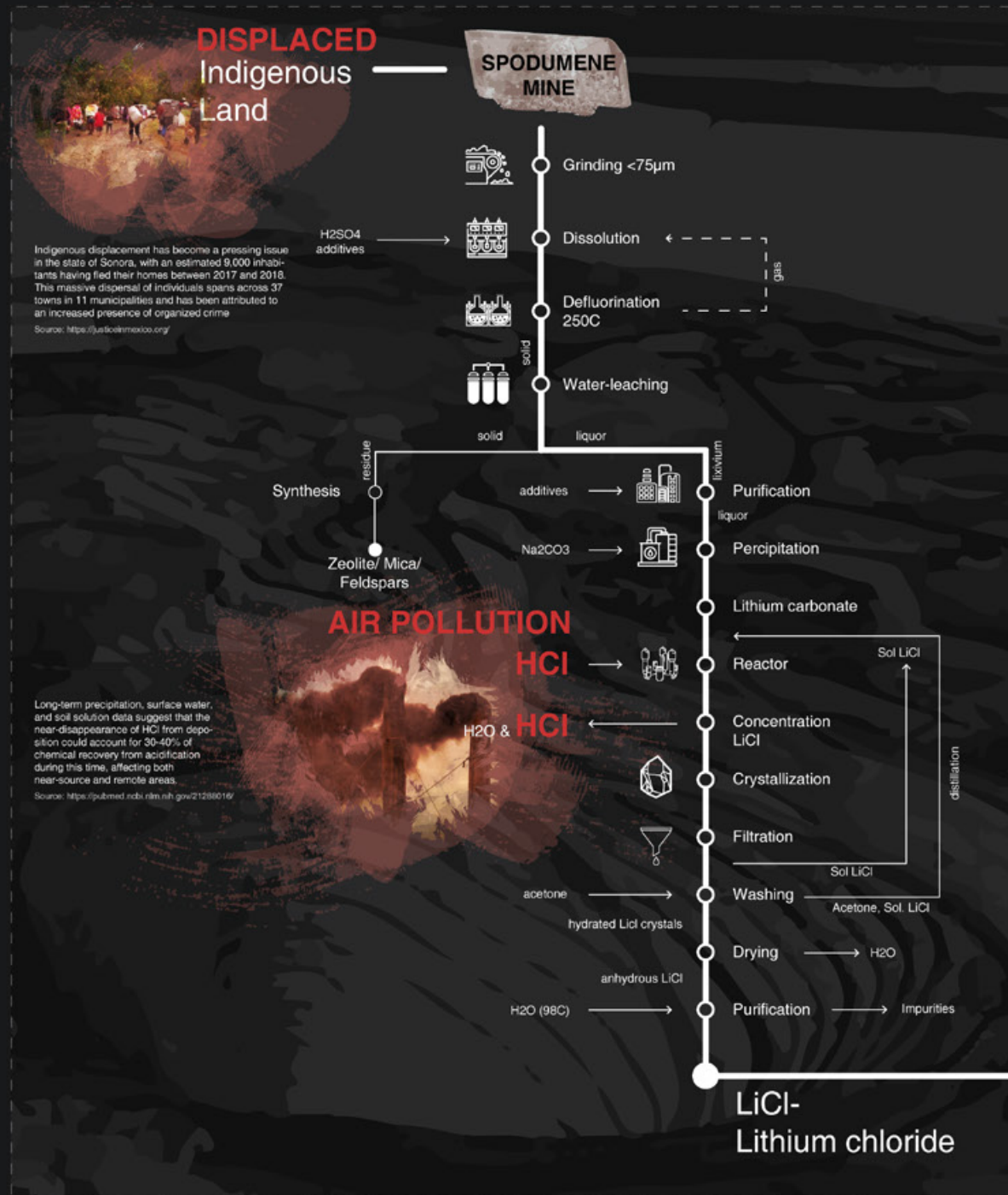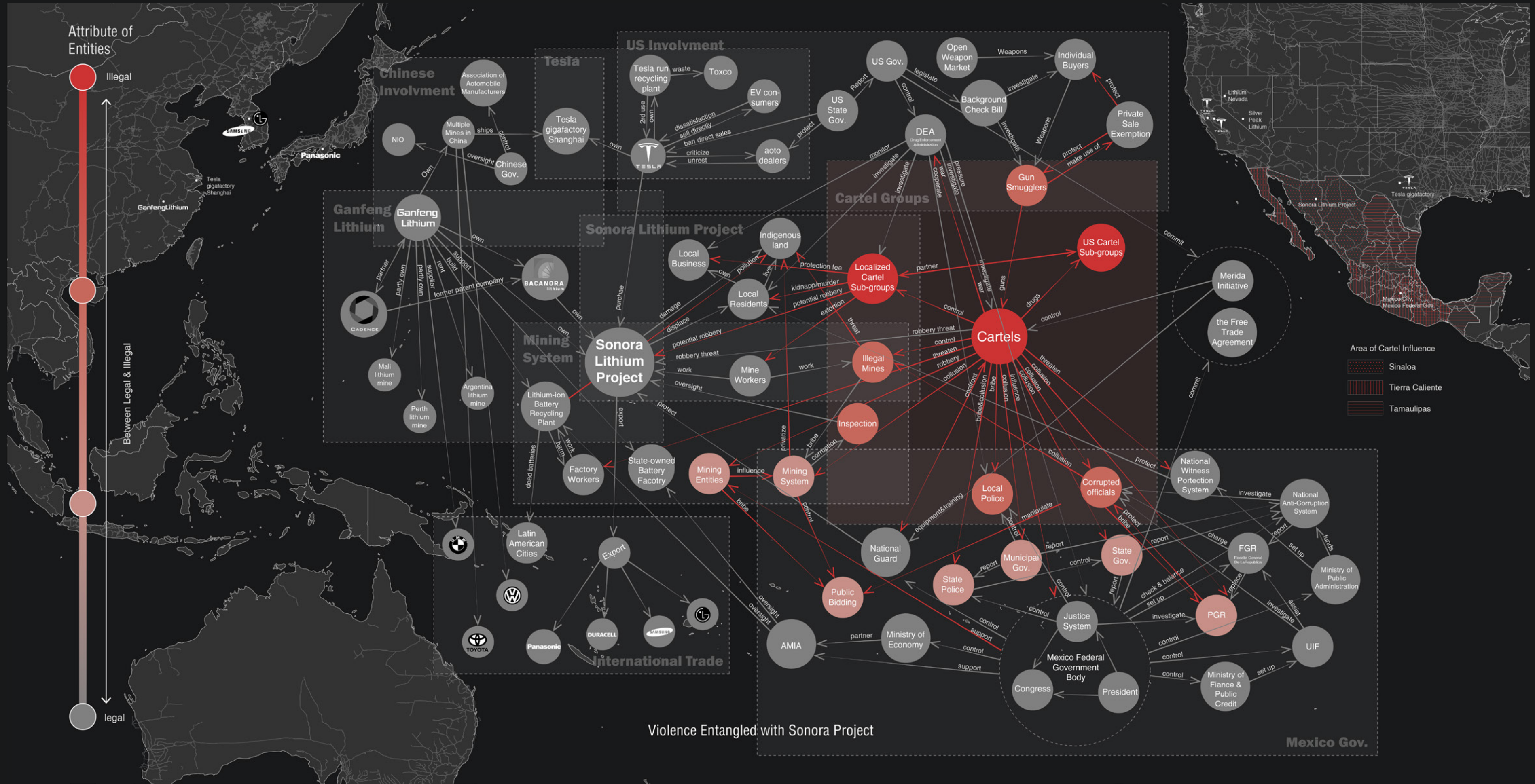Geographically linking the US and Mexico border, the Sierra Madre Occidental is visibly rich in mineral deposits, acting as a canal bringing in northern investments and mining sites. When it comes to the States, the Sierra Nevada mountain range between California and Nevada and the Rocky Mountain range between Utah and Colorado have an evident mining site population.

Three panels are drawn collectively to analyze the complex landscape of extraction between the Mexico and US border:
Mining demands heavy use of water in processing ore. The principal mine water source is the "rainfall" and nearby major water bodies around the mining area. The river network is a primary geographic criterion. Mining requires displacement but at the same time generates thriving mining communities, which draw people from the closest cities for employment. 20% of jobs are directly employed at operating mines, 35% are employed in the mining industry, and 45% of mining supplier and service jobs related to the mining do not necessarily have to be on-site. They are located mainly in the closest metropolitans. Extraction processes are broadly determined by the physical state of the ore to be mined and its location in the strata. Extraction steps are, in concept, similar to all methods with the same goal of extracting ore with the most efficiency.

Lithium became our main focus of this extractive taskscape-

Left Panel

DISPLACED Indigenous Land

SPODUMENE MINE

Indigenous displacement has become a pressing issue in the state of Sonora, with an estimated 9,000 inhabitants having fled their homes between 2017 and 2018. This massive dispersal of individuals spans across 37 towns in 11 municipalities and has been attributed to an increased presence of organized crime.
Source: https://justiceinmexico.org/

- Grinding <75µm
- Dissolution — H2SO4 additives
- Defluorination 250C — gas
- Water-leaching — solid / liquor

Long-term precipitation, surface water, and soil solution data suggest that the near-disappearance of HCl from deposition could account for 30-40% of chemical recovery from acidification during this time, affecting both near-source and remote areas.
Source: https://pubmed.ncbi.nlm.nih.gov/21298016/

AIR POLLUTION HCl

- Synthesis
- Zeolite/ Mica/ Feldspars
- Purification — additives
- Percipitation — Na2CO3
- Lithium carbonate
- Reactor — Sol LiCl
- Concentration LiCl — H2O & HCl
- Crystallization
- Filtration — Sol LiCl
- Washing — Acetone, Sol. LiCl / acetone
- hydrated LiCl crystals
- Drying — H2O
- anhydrous LiCl
- Purification — Impurities — H2O (98C)

LiCl- Lithium chloride

Demand for Lithium-ion Batteries is Forecast to Surge Across Sectors

Legend: Consumer Electronics, Commercial EVs, Stationary Storage, Electric Two-wheelers, Passenger EVs, E-buses

2015, 2018, 2021, 2024, 2027, 2030 (GWh axis 0.5–2.0)

Demand for lithium is expected to surge over the next decade, owing largely to the evolution of the electric vehicles (EVs) market. EVs at present account for 75,000 t/yr of lithium demand, or roughly 24pc of total global demand. But it expects this figure to rise to 1.42mn t/yr by 2030, or 79pc of total demand, based on forecasts for the growing production of hybrid, fully electric and other vehicles that use lithium-ion batteries.
Source: https://www.argusmedia.com/en/news/2136196-evs-to-account-for-79pc-of-lithium-demand-by-2030

Center Panel

Lithium is an integral component of batteries for electric vehicles. As EV purchases have rocketed – over 2 million vehicles were sold in 2018 alone. Production of the battery metal is set to almost triple by 2025 to more than 1.5 million metric tons, but there are concerns that a fall in upstream investment could flip the market into undersupply further out.
Source: https://www.spglobal.com/en/research-insights/articles/lithium-supply-is-set-to-triple-by-2025-will-it-be-enough

World Lithium Productio and Projection (Production in 1000 tons/year, 0–700; years 1920–2020)

- smartphone batteries 2-3g
- e-bike batteries 30-120g
- tablet batteries 20-30g
- e-bike batteries 30-120g
- laptop batteries 30-40g
- Electric Vehicles 11-40kg
- power tool batteries 40-60g

Lithium-ion Batteries

first cycle

second cycle

E-WASTE

Plastic — Binder

LiPFs

- manually sorted & disassembled
- Shredded
- Electrolyte extraction — Organic carbonates
- Magnetic seperation — Iron
- Zig-zag classifier
- Thermal treatment — Copper, Aluminum, Graphite
- Air jet sieving
- Leaching — H2SO2, H2O8
- Precipitation
- Sintering — Cathode material

In Australia, for example, only 2–3% of Li-ion batteries are collected and sent offshore for recycling. The recycling rates in the European Union and the US—less than 5%—aren't much higher.
Source: https://cen.acs.org/materials/energy-storage/time-serious-recycling-lithium/97/i28

Right Panel

BRINE

WATER & SOIL POLLUTION

Massive Water Usage
DESERTIFICATION

The production of lithium in the Salar de Atacama consumes around 1.5 million liters of water per metric ton of lithium carbonate. High water consumption in desert regions is a weak link in lithium production. "Water is being evaporated in the driest region on earth – a paradox," said Carolina Ferreira.
Source: https://www.pv-magazine.com/2020/02/18/la-fron-tiers-um-from-chile-paradox/

- Solar Evaporation — Salts of Na, K, Mg, etc.
- Solvent Extraction — Boron Removal
- Precipitation — Ca(OH)2 — boron free brine
- Crystalization
- Filtration — Mg, Ca, B
- Precipitation — Ca(OH)2
- Filtration — Ca, Mg Residues
- Carbonation
- Filtration
- Li2CO3 — Conversion Dissolution & crystalization — Ca(OH)2
- Re-dissolution
- Ion Exchange Resin
- Crystalization
- Ultra Pure Li2CO3
- LiOH Solution
- Electro-dialysis
- Crystal-ization
- Filtration
- LiOH.H2O
- HCl

LiCl **LiCl**

Some eyewitnesses reported seeing cow and yak carcasses floating downstream, dead from drinking contaminated water. Lithium extraction inevitably harms the soil and causes air contamination.
Source: https://www.wired.co.uk/article/lithium-batteries-environment-impact

Biopolar Disorder Medicine
Lithium (Eskalith, Lithobid) is one of the most widely used and studied medications for treating bipolar disorder. Lithium helps reduce the severity and frequency of mania.

Aircraft/ space Breathing gas purification system
The use in portable electronic devices is probably the most frequent, but they are also installed to provide power for various aircraft systems.

Annual Availability of Second Life Batteries, Worldwide, GWh

(GWh axis -100 to 300; years 2019–2030)

Legend: Annual Remanufacturing/ Second Life Waste; Benefit of Batteries from Second Life Application

Violence Entangled with Sonora Project

Attribute of Entities

Illegal

Between Legal & Illegal

legal

Area of Cartel Influence

Sinaloa

Tierra Caliente

Tamaulipas

https://vimeo.com/583492708

Using video format, our investigation starts by looking at the proposed mine site's environmental and societal impact.

Tracing the existing plan of the Sonora Lithium extraction project, we identified the towns at risk of water and air pollution and also potential labor violations. In addition, following the stream of the Bavispe River, the primary water resource in the surrounding areas, we found it is only 9 miles away from the extraction site, which is under dire concern regarding the future lives of residents.

Huásabas | Population 865
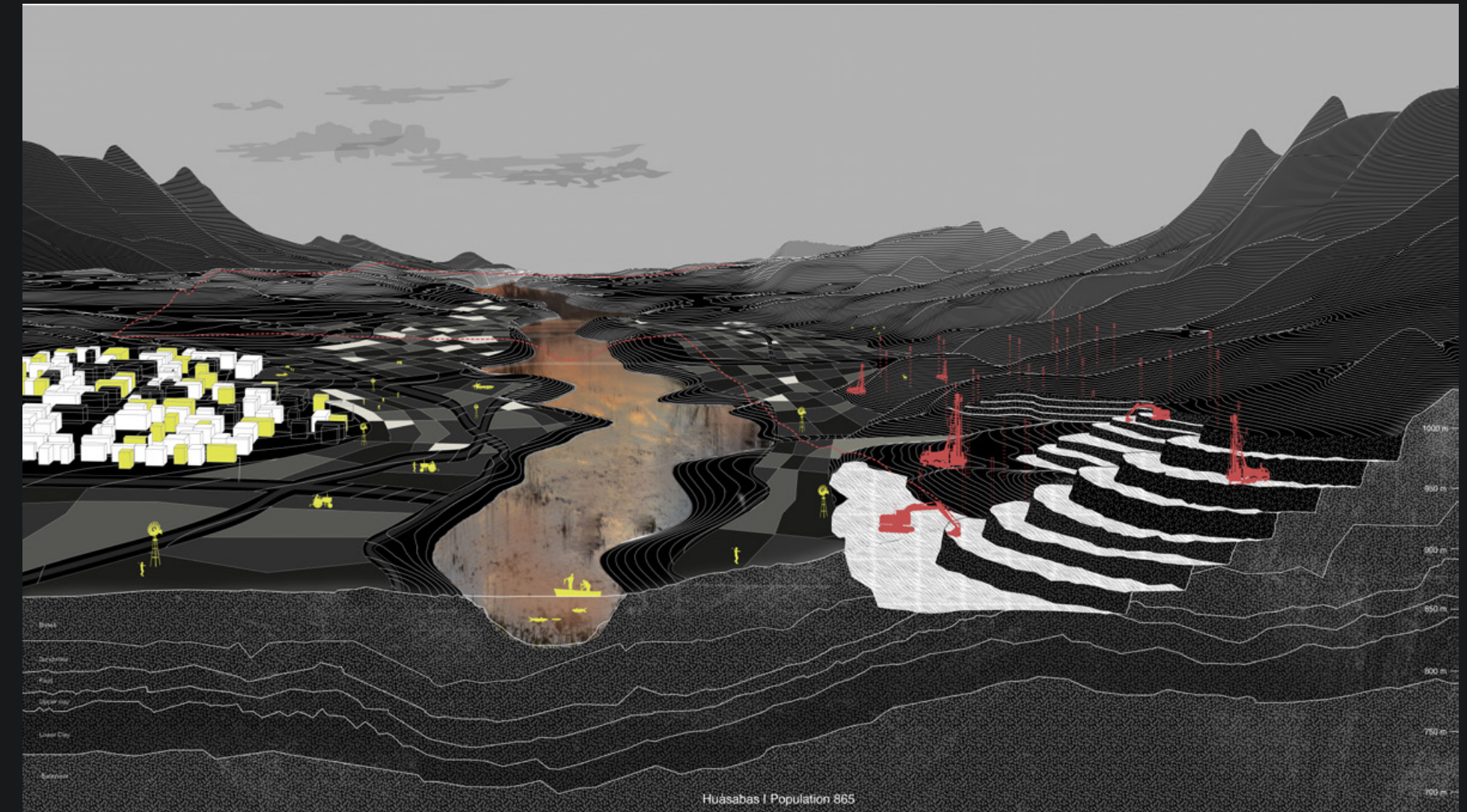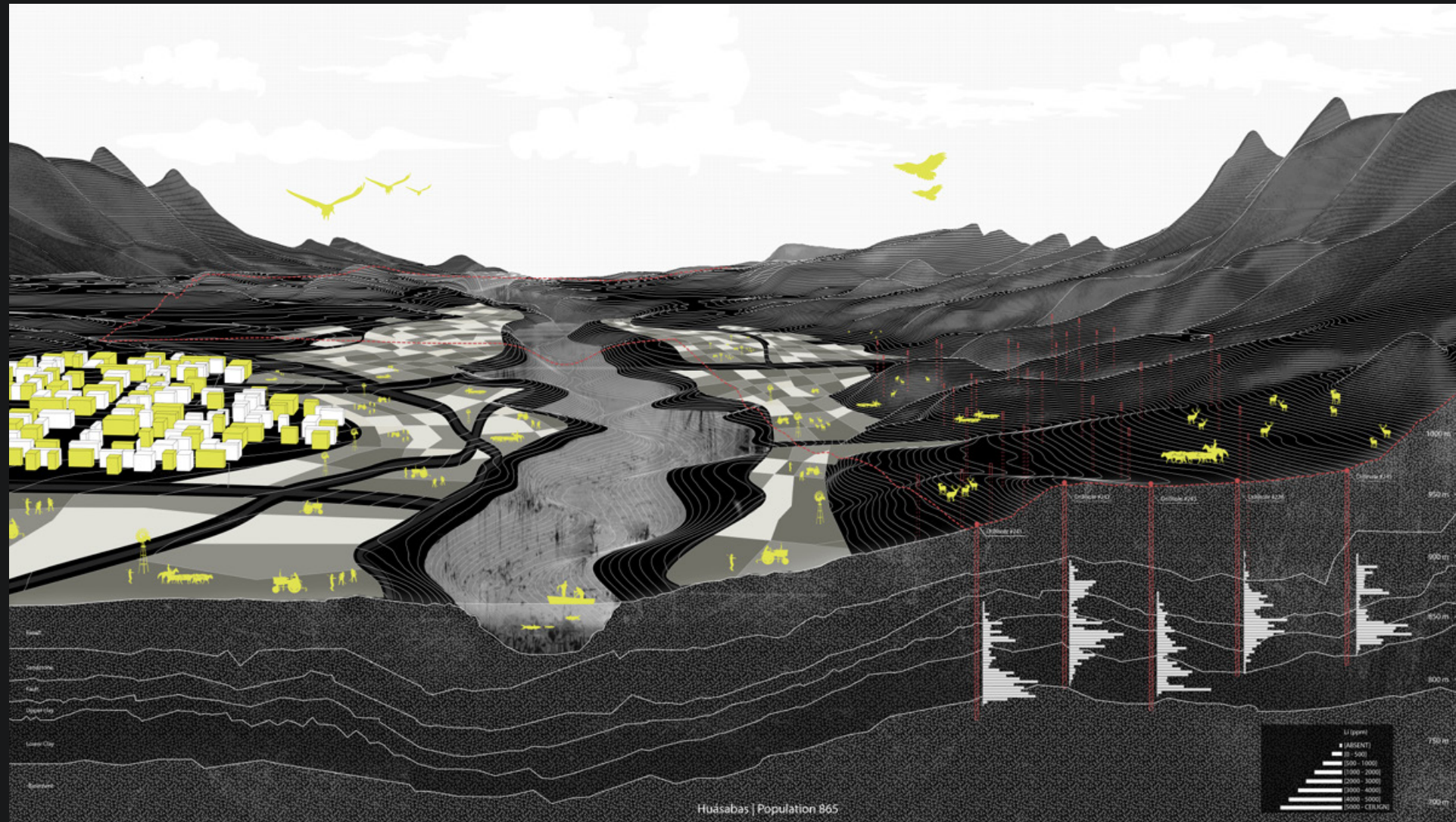
This interpreted extractive landscape is drawn to showcase what the potential future of the town of Huasabas could be-
River polluted, mountains removed, wildlife habitat disrupted, and all without the promised employment from the mining companies.

Conflict Urbanism

Spring 2022
Columbia GSAPP
Instructor: Laura Kurgan
Team: Yani Gao, Hyuein Song, Myungju Ko

"This seminar looks at the ways in which cities have long been arenas of friction, difference, and dissidence, as well as the ways in which their irreducibly conflictual character manifests itself in everything from neighborhood borders, to differences of opinion and status, to ordinary encounters on the street."

Redefining Homogeneity:
MARRIAGE MIGRATION IN SOUTH KOREA

Once a country known for its homogeneity, South Korea's population is no longer homogeneous. Over the past 30 years, South Korea's highest in-migration rate has been through marriage. Primarily women from southeast Asian countries – China, the Philippines, Vietnam, and Cambodia – have been encouraged by government-sponsored subsidies to get married in South Korea. This 'marriage migration' was driven by the considerable numbers of unmarried men in rural towns, resulting from fast economic growth and internal migration by rural women to urban areas. The migrant brides, in turn, have created economic and cultural links between Korea and their home countries. This cultural and social phenomenon(Onishi 2008), this movement has vast implications and impacts on the future of this country and on what it now means to be identified as "Korean."

This project investigates these international and domestic scale movements; they reveal a spatial complexity created by marital cultures and local policies, all ultimately driven by economic necessity.
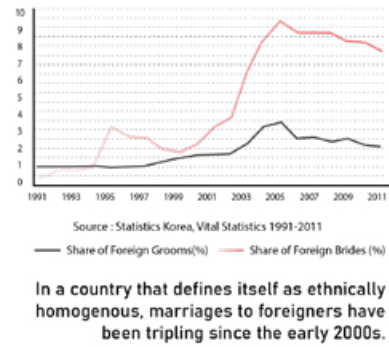
In a country that defines itself as ethnically homogeneous, marriages to foreigners have been tripling since the early 2000s.

"...marriage migrants play multiple roles – as mothers, domestic workers, caretakers, or family helpers."

Eunji Lee, Soon Kim, Kyunghee Jung-Choi, Kyoungae Kong , <Household Decision-making and the mental well-being of marriage-based immigrant women in South Korea>

Domestic Migration in South Korea: 1970s and Onward

Since the Korean War, South Korea has been experiencing tremendous and steady economic growth. In 2022, it is now the 10th largest world economy. The drastic increase in its national GDP from the 80s till now was coined the "miracle on the Han River." Along with the economic growth, a mass country-wide migration from rural to urban areas has been ongoing. As a result, more than 50 percent of the national population now lives in the Seoul metropolitan area, which accounts for only 0.6 percent of the country's land area.
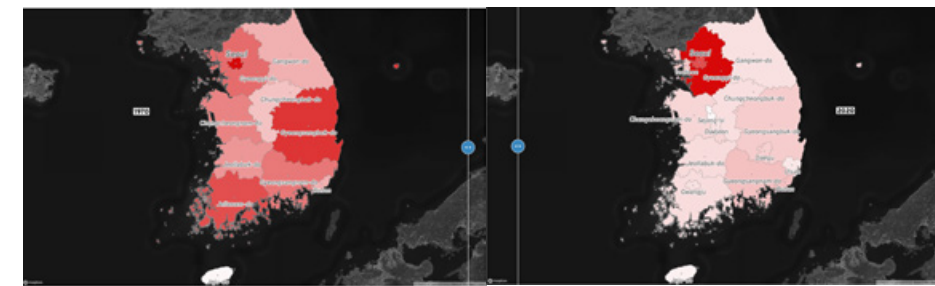
Domestic Migration in South Korea: 1970s and Onward

Despite these recent economic changes and rural-urban migration, social life in South Korea remains embedded in Confucian culture, especially in rural areas, where the emphasis is placed on family and kinship. The patrilineal Confucian definition of the family has an immense impact on domestic migration across Korea. Confucianism underscores that filial piety is a cardinal virtue and that marriage and procreation are the eldest son's most important social obligations. (Hsu 61)

A traditional Korean nuclear family, according to Confucianism values, has four formal criteria:

The nuclear family 가 (家).
The family's formal head Hoju 호주 (戶主), the oldest man in the family, holds significant rights and privileges.
The successor to the head-of-house 호주계승 (戶主繼承), which is the eldest son.
The estate is considered family property 가산 (家産).
This Korean nuclear family is ruled entirely patrilineally, where the prominent family unit is the direct line of descendants 친족 (親族). Other relatives through female kinships are considered outside family 외갓집 (外家). Therefore, when a daughter marries, she will be immediately called "an outsider," leaving the family unit. In other words, she joins her husband's family and is responsible for her domestic duties, including serving him and his parents, thereby maintaining traditional family customs and reputations.

Because of these traditional family practices, more men remain in rural areas than women, contributing to the decline in birth rate that has persisted in Korea since the 60s. The gender imbalance in rural South Korea caused a sharp drop in population in rural towns. As a part of the revitalization program of those rural municipalities, local governments started to provide subsidies for 'marriage migration,' and therefore to foreign brides, starting in the 90s.
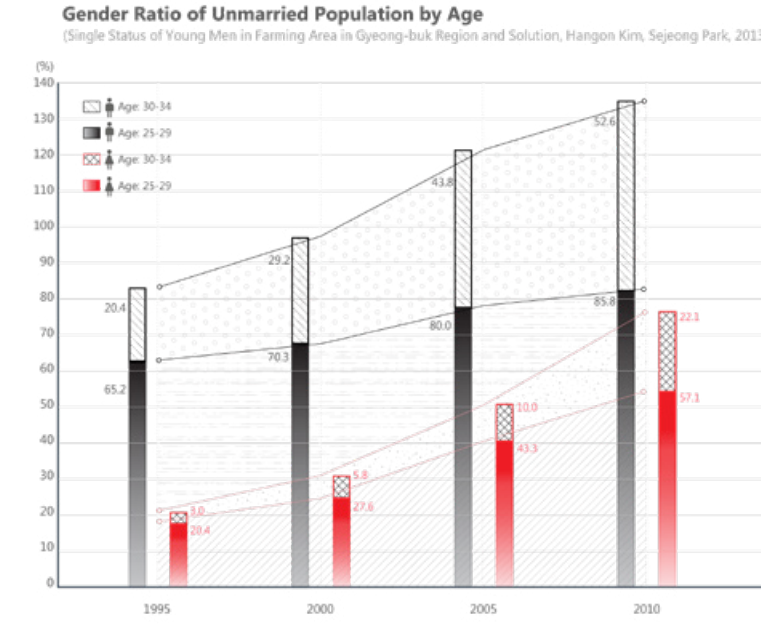
Gender Ratio of Unmarried Population by Age
(Single Status of Young Men in Farming Area is Gyeong-buk Region and Solution, Hangon Kim, Sejeong Park, 2013)

### International Marriage Migration to South Korea

In the 1990s, 35 rural municipal governments started subsidizing private marriage brokers to introduce unmarried male farmers to ethnically Korean women in China and women from other Asian countries, paying the brokers 4 to 10 million Korean won (back then, around $3,800 to $12,000) per marriage.
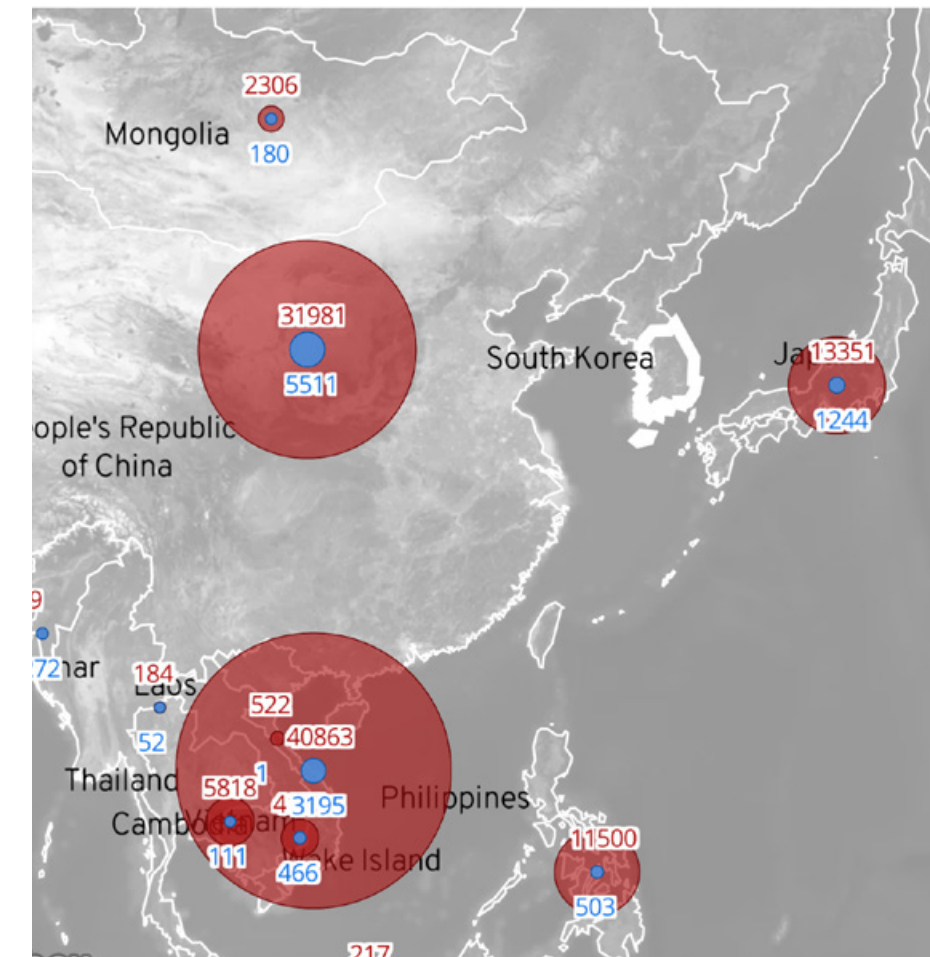
International Marriage Migration to South Korea

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These policies were established in an attempt to address the aging population by encouraging these unmarried men to find a wife and eventually reproduce to increase population growth. However, after 30 years of this practice, in 2021, government subsidies started to be removed. As a result, in South Korea, between 2000 and 2005, such marriages increased almost fivefold, from 6,945 to 30,719 (Korea National Statistical Office 2011a). Now bolstered at more than 334,000, these marriage migrants (immigrants and naturalized by marriage) account for 16.7 percent of all immigrants in South Korea. Renowned as a monoethnic country, Korea is now demographically and politically shifting towards becoming a multi-ethnical society.

Woman Marriage Migrants by Country
(Ministry of Justice, Korea Immigration Service, 2020)
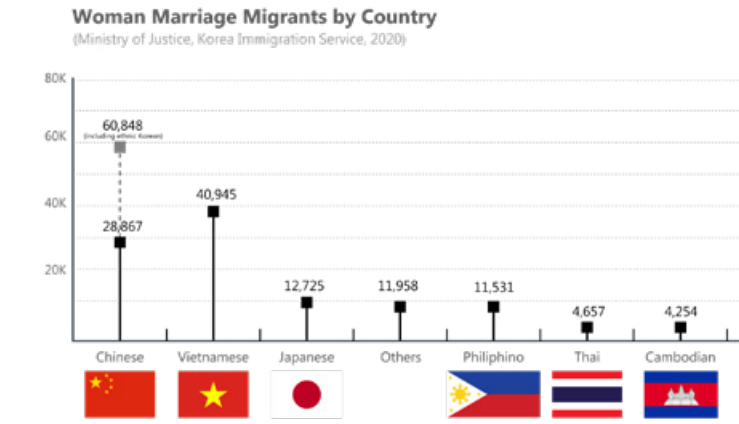
However, these political movements and economic subsidies supporting marriage migration are not 100% celebrated and, in fact, have an adverse effect. Marriage migrants report facing higher levels of domestic and social conflict. They are isolated from their home countries and remain disadvantaged in these new environments. Furthermore, they tend to face more economic difficulties since more men from rural lower-income brackets seek help from marriage agencies for foreign brides. A study conducted by Ewha Womans University in 2022 has found that "…immigrant women in patriarchal households were more likely to be depressed … poorer life satisfaction … and poorer marital satisfaction … than women in martially equal households." (PLOS ONE 2022)
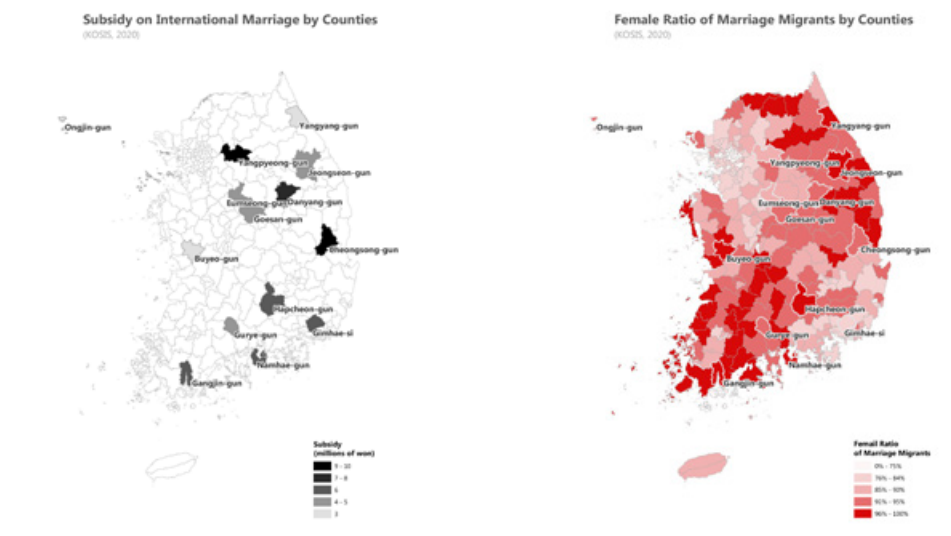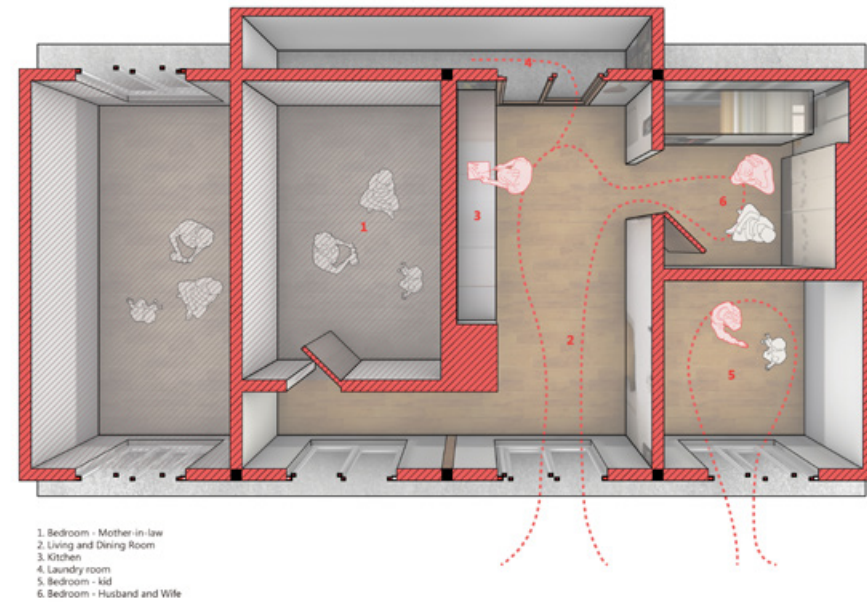
Marriage migrants have also been expected to maintain the patriarchal hierarchy by acting as compliant and submissive wives, limiting their career growth and eventual integration into Korean society. Language barriers, cultural differences, and financial dependencies contribute to the characteristic isolation these new immigrants face in the so-called homogenous society in which they have: '…marriage migrants play multiple roles - as mothers, domestic workers, caretakers, and family helpers." (Piper and Roces 2003)

The Story of Pham, from Vietnam to Cheongsong County

Cheongsong County, a county in Gyungsang-buk Province, has an influx of marriage migrants, which make up more than 69 percent (160 of 231) of the foreign residents in the municipality. Among them, the overwhelming proportion is women. Additionally, Cheongsong County, a rural area of the province, was one of the counties that sponsored the most significant subsidies (up to 10,000 dollars per case) for international marriage as a part of rural revitalization policies.

GYUNGSANG-BUK PROVINCE

CHEONGSONG COUNTY

Cheongsong Marriage Migrant Population
(KOSIS, 2022)
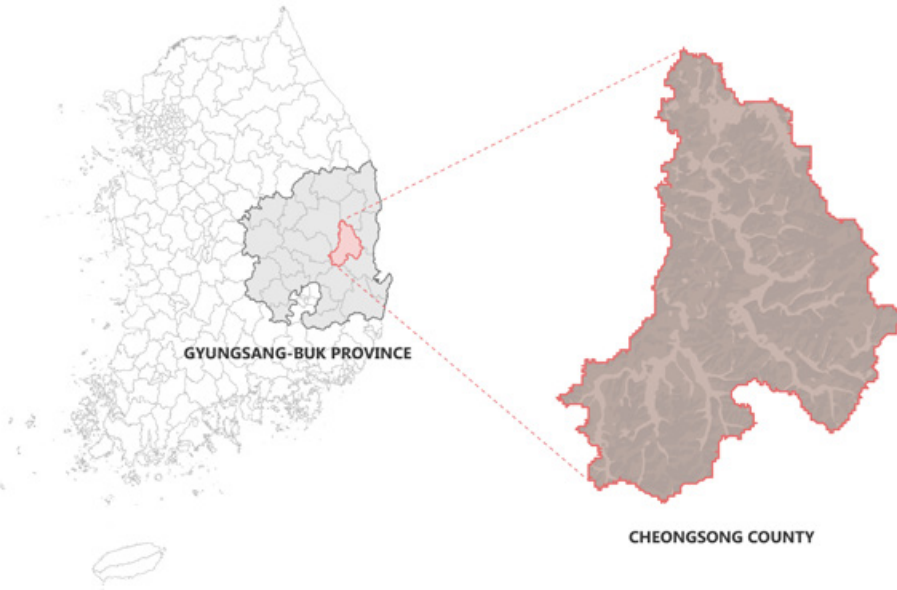
In this section, we are translating the architectural space inhabited by a marriage migrant from Vietnam- Pham, through the images portrayed in the documentary film "Tales of Multicultural Inlaws." By reconstructing the typical rural house where a marriage migrant lives in Cheongsong, we transform this narrative into a more intimate one. Her hierarchy in the household becomes visible to the viewers- you can see the limited access she has to a lot of the house and her workspace in her living quarters, including the kitchen, living room, and kids' room. This- clearly shows her unequal position and traditional feminized role in the family.

1. Bedroom - Mother-in-law
2. Living and Dining Room
3. Kitchen
4. Laundry room
5. Bedroom - kid
6. Bedroom - Husband and Wife

Despite these unfortunate circumstances, more and more individuals have broken this stereotype and become visible in Korean society. In addition, multicultural support centers in communities help integrate new immigrants. Furthermore, policies such as the "Female Marriage Migrant Family Social Integration and Support Policy" and the "Foreigners in Korea Fundamental Treatment Law" help ensure their successful entrance into Korean society.

While these domestic support policies and groups are significant in helping these marriage migrants, the economic benefit these women sent home and the numbers of unmarried men in rural Korea, which remains a phenomenon, means that this marriage migration will not disappear in the short term, and must remain as an ongoing social and cultural concern.

Conclusion

The research exposes the so-called homogeneity of South Korea through the lens of marriage migration at various scales, from the global to the intimate. The story visualizes how urbanization in one country has an impact across the border between countries and permeates everyday life in South Korea— combined with the Confucian culture, which is deeply rooted in rural areas. The urbanization of South Korea has created an unbalanced gender ratio in the rural towns in addition to the more common issues exacerbated by urbanization, such as population decrease and underdevelopment. As a result, female marriage migrants from neighboring countries have been filling up the voids created by urbanization.
This phenomenon has caused adverse effects, revealing how South Korea's so-called homogeneity, a distinct characteristic and pride of the county, is forever transformed.
This research is conducted from the perspective of Korean society, which mainly investigates through the data visualization of population movements. However,

if conducted through a political and economy-driven approach, this phenomenon would reveal much more conflict on the scale of international affairs. Therefore, a probable different approach would be to trace back these marriage migrants to their home country by collecting data on their remittance and investigating how this money drives the supply of potential migrants.

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Yamanaka, Keiko, and Nicola Piper. 2003. "An Introductory Overview." Asian and Pacific Migration Journal , vol. 12, nos. 1-2, pp

EBS, Documentary Film "Tales of Multicultural Inlaws - The hidden story of a daughter-in-law who is always hungry", 2015

Soft Edged Erie
INCLUSIVE PLANNING ON EXCLUSIVE GROUNDS

Advanced Studio VI, Spring 2022
Columbia GSAPP
Instructor: Laura Kurgan
Site: Rome, NY
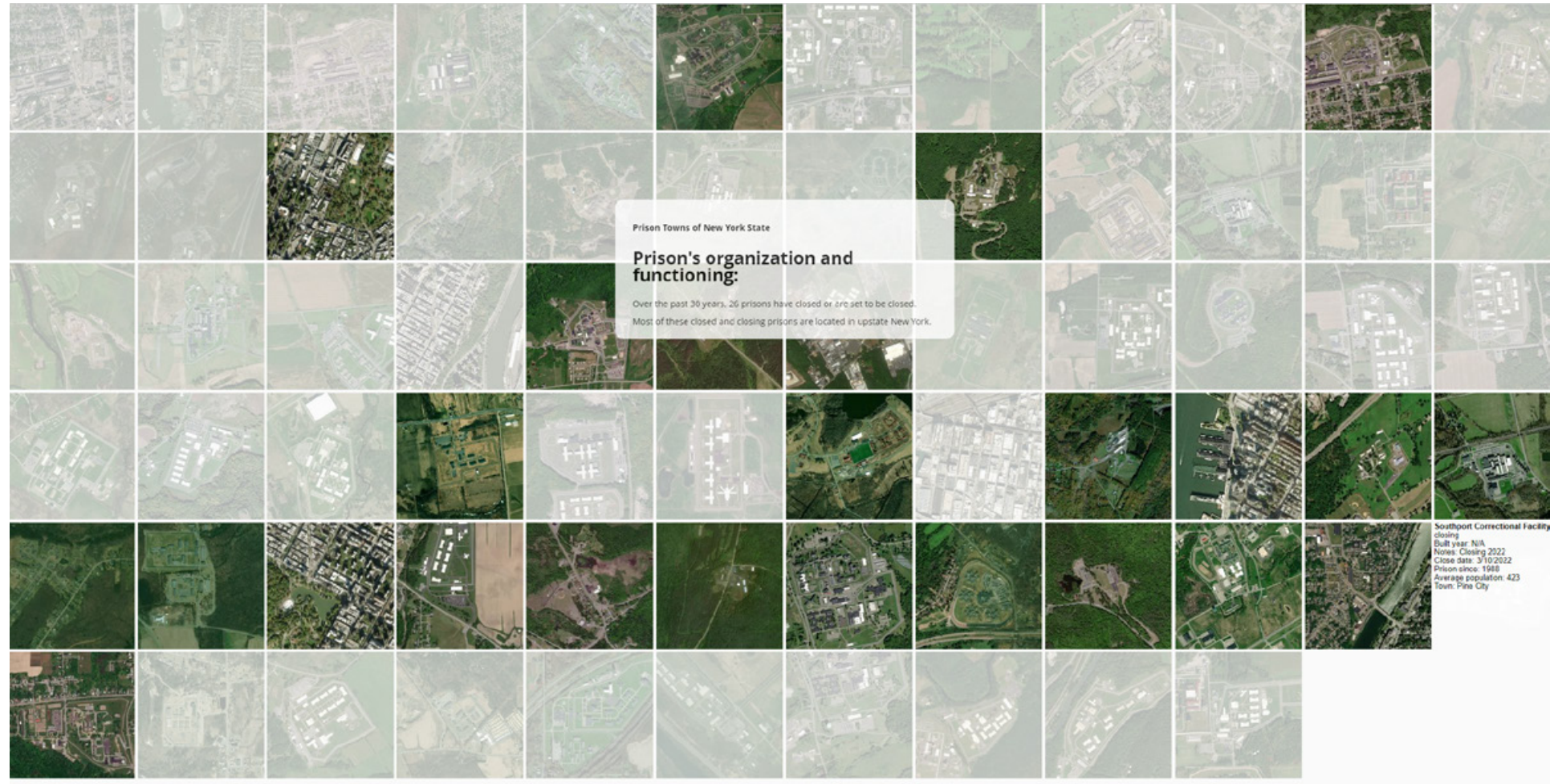*Individual Project*

With a 56% reduction in prison population since 2000, 26 prisons in New York State have closed and more are set to be closed. Layering these closures with policies, economic and community impact, pushback, political positions, environmental concerns, as well as the decentralization of the criminal justice system, this research seeks to envision post-prison futures in the rural towns of upstate New York. It also explores the flows and transfers through the prison economy that interconnect these towns and New York City. A range of visions focus on prisons, towns or the system of mass incarceration, and consider state infrastructures- carceral, water, food, power, waste- as urban exostructures.

In the city of Rome, a prison has been closed since 2011. And I ask this question: What if the old Erie Canal acquires 'soft edges' in Rome, NY, to promote an alternative town adapting to annual flooding and reflect on past exclusive history with inclusive, conscious planning and building programs?

Currently Rome is considered to have a major risk of flooding. Where 14% of all properties in the city have more than 26% chances of being severely affected by flooding over the next 30 years. For the past 10 years, multiple redevelopment projects and proposals have been raised by the local and state governments surrounding the Erie Canal, while none of them have been realized, they also don't address the issues of changing floodplains and the equity of local residents. Instead, they focus a gentrified, tourism based future, while ignoring the changing edge of the river itself.

My proposal is in contrast, soft-edged, explores a new way of designing cities, one which places adaptation of climate change, wellness, and connection to nature at the forefront. This proposal aims toestablish a blueprint for urban design for the future, whereby examining a range of strategies- from designing flood mitigation and resilience architecture to flood edge public place-making for the community -could suggest a different approach to the exostrucutres in Upstate NY.

https://palejelly.github.io/MassIncarceration/

Current Carceral Landscape of NYS

Location of 26 Closed/ Closing Prisons

	Name	Prison Since
1	Clinton Correctional Facility	1844
2	Albion Correctional Facility	1894
3	Bedford Hills Correctional Facility	1901
4	Oneida Correctional	1915
5	Attica Correctional Facility	1931
6	Beacon Correctional	1932
7	Woodbourne Correctional Facility	1933
8	Wallkill Correctional Facility	1933
9	Coxsackie Correctional Facility	1935
10	Green Haven Correctional Facility	1949
11	Great Meadow Correctional Facility	1954
12	Edgecombe Correctional Facility	1956
13	Monterey Shock Incarceration Correctional	1958
14	Summit Shock Incarceration Correctional	1960
15	Camp Georgetown	1961
16	Bayview Correctional	1970
17	Elmira Correctional Facility	1970
18	Sing Sing Correctional Facility	1970
19	Auburn Correctional Facility	1971
20	Adirondack Correctional Facility	1971
21	Clinton Annex at Clinton Correctional	1972
22	Rochester Correctional Facility	1973
23	Eastern Correctional Facility	1973
24	Taconic Correctional Facility	1973
25	Fulton Correctional	1975
26	Queensboro Correctional Facility	1975
27	Mid-Orange	1976
28	Arthur Kill Correctional	1976
29	Mount McGregor Correctional	1976
30	Otisville Correctional Facility	1976
31	Fishkill Correctional Facility	1977
32	Hudson Correctional Facility	1978
33	Downstate Correctional Facility	1979
34	Watertown Correctional	1982
35	Ogdensburg Correctional Facility	1982

Within the past 30 years, 26 prisons are now closed.

	Name	Prison Since
36	Collins Correctional Facility	1982
37	Groveland Correctional Facility	1982
38	Lyon Mountain Correctional	1983
39	Mid-State Correctional Facility	1983
40	Wende Correctional Facility	1983
41	Shawangunk Correctional Facility	1983
42	Altona Correctional Facility	1983
43	Lincoln Correctional	1984
44	Greene Correctional Facility	1984
45	Wyoming Correctional Facility	1984
46	Orleans Correctional Facility	1984
47	Butler ASACT Catchment Facility	1985
48	Washington Correctional Facility	1985
49	Sullivan Correctional Facility	1985
50	Butler Correctional	1986
51	Franklin Correctional Facility	1986
52	Lakeview Shock Incarceration Correctional Facility	1987
53	Southport Correctional Facility	1988
54	Mohawk Correctional Facility	1988
55	Bare Hill Correctional Facility	1988
56	Cape Vincent Correctional Facility	1988
57	Riverview Correctional Facility	1988
58	Cayuga Correctional Facility	1988
59	Moriah Shock Incarceration Correctional Facility	1989
60	Marcy Correctional Facility	1989
61	Chateaugay Correctional	1990
62	Gouverneur Correctional Facility	1990
63	Ulster Correctional Facility	1990
64	Hale Creek Correctional Facility	1990
65	Livingston Correctional	1991
66	Buffalo Correctional	1992
67	Gowanda Correctional	1994
68	Willard Drug Treatment Campus	1995
69	Upstate Correctional Facility	1998
70	Five Points Correctional Facility	2000

Median Income per County

41.4k   67.5k   93.7k

Political Index across Prison Counties

Republican   center (swinging)   Democrat

Water flows down both 85-mile-long Delaware Aqueduct and 92-mile-long Catskill Aqueduct by gravity

and passes through a 1.5 billion dollar treatment facility

UV radiation kills bacteria

into the tap!

The New York City Watershed

spans nearly 2000-square-miles, with a labyrinth of 19 reservoirs and aqueducts to provide 1.2 billion gallons of drinking water daily to 9 million New Yorkers. By 2018, the city had already spent 2.8 billion dollars on this unfiltered water supply system.

Catskill / Delaware Watersheds

East of Hudson Watersheds

"We have spent millions of dollars on making sure the water that we take from the Hudson is ok... and we spend money to make sure it is safe to drink, but we need to protect is at the source. You can't continue to spend the precious captial dollars you have on making sure water is good after it's been taken it."
- Poughkeepsie Mayor Rob Rolison

"There's a lot of back and forth between keeping (New York City) happy, and people up here happy. I think it's more important to keep the people up here happy."
- Hudson River Watch memeber Landewe

"I have not seen the water this brown, it's been a battle all summer, just how not clear the creek has been. I don't want my children play at in the water now."
- A mother watching her children play at the edge
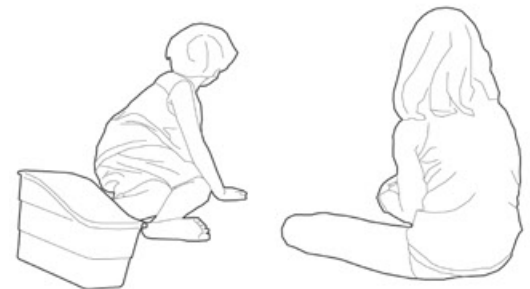
"What we're basically asking of the city is, don't continue this status quo solution, which is a great solution for you, but ruins the environment downstream, and ruins it for the communities that rely on that downstream."
- Riverkeeper's Dan Shapley

Communities around the watershed

While being coined the champagne of drinking water, the NYC watershed's immediate surroundings have been accustomed to environmental and tap water pollution complaints.

	Underground Aquifer
	Reservior
	State Owned Land
	Acquisition Priority Areas
	Aqueduct
	Water Quality Complains

NYC Watershed
- Inequality Around Water Exostructure

NYC

NYS

Canal Finished

Density of Population per sq mile

1810 1815 1820 1825 1830 1835 1840 1845 1850

Delta Reservoir

LAKE ONTARIO

CARTHAGE

ROME

UTICA

ROCHESTER

SYRACUSE

SCHENECTADY TROY

ALBANY

BUFFALO

LAKE ERIE

NEW YORK

OLEAN

BRINGHAMTON
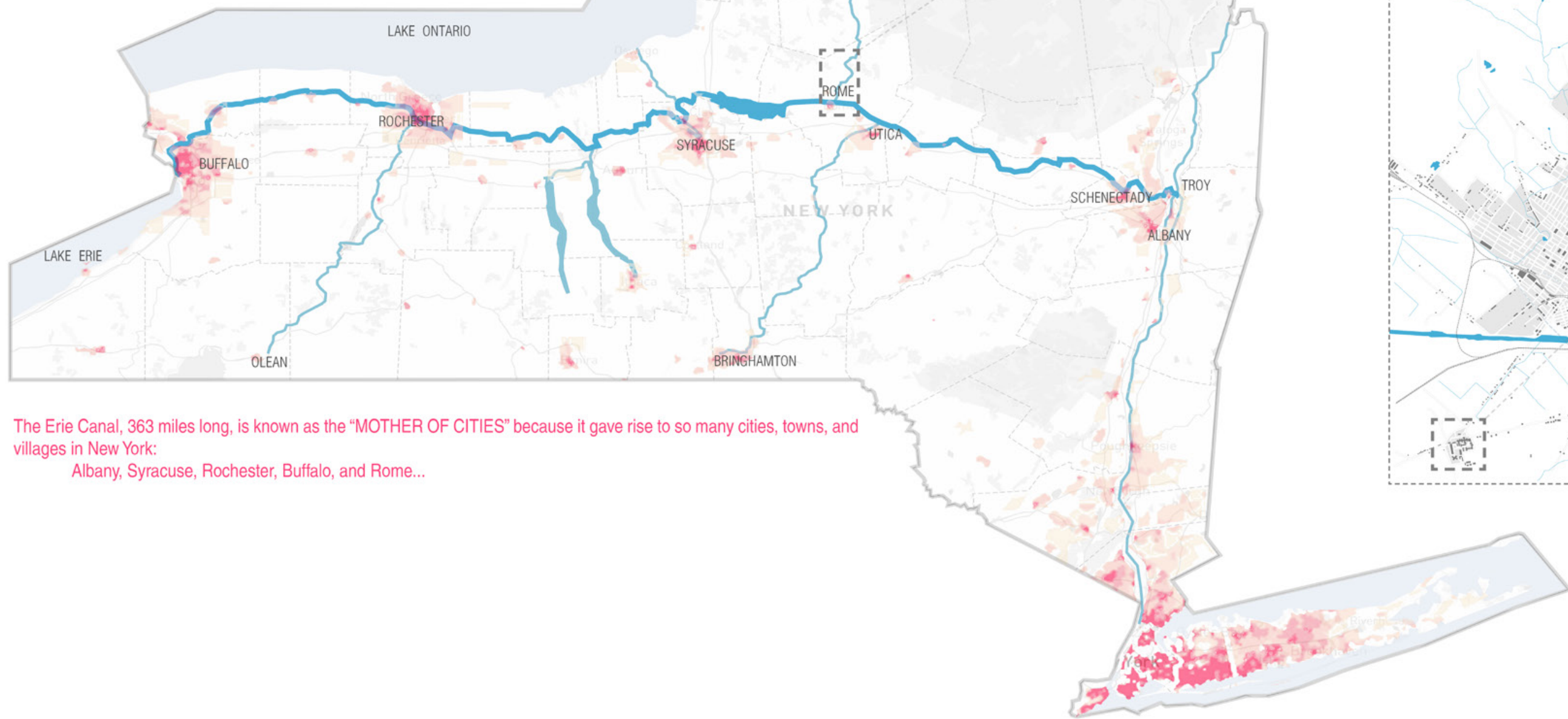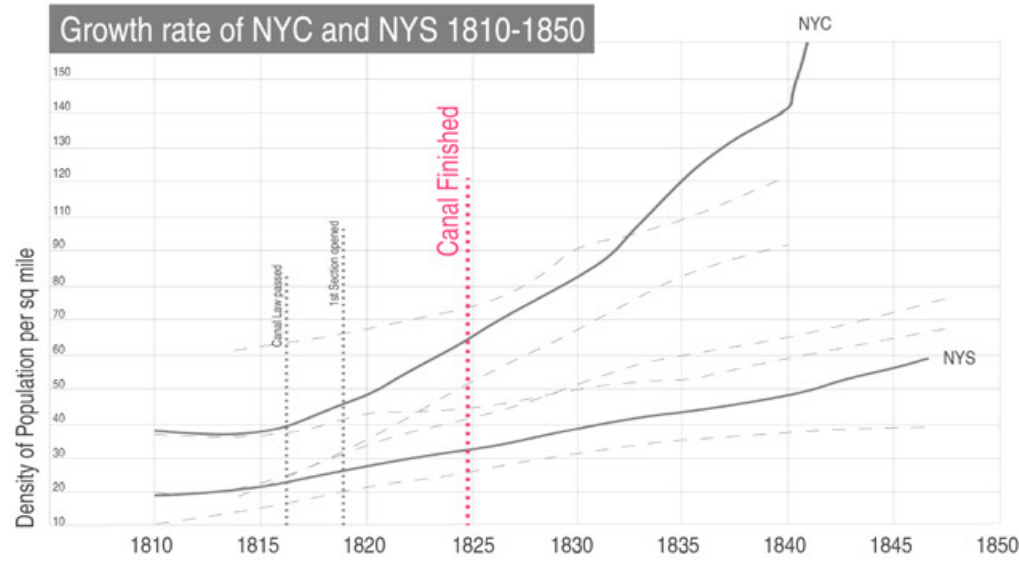
The Erie Canal, 363 miles long, is known as the "MOTHER OF CITIES" because it gave rise to so many cities, towns, and villages in New York:
      Albany, Syracuse, Rochester, Buffalo, and Rome...
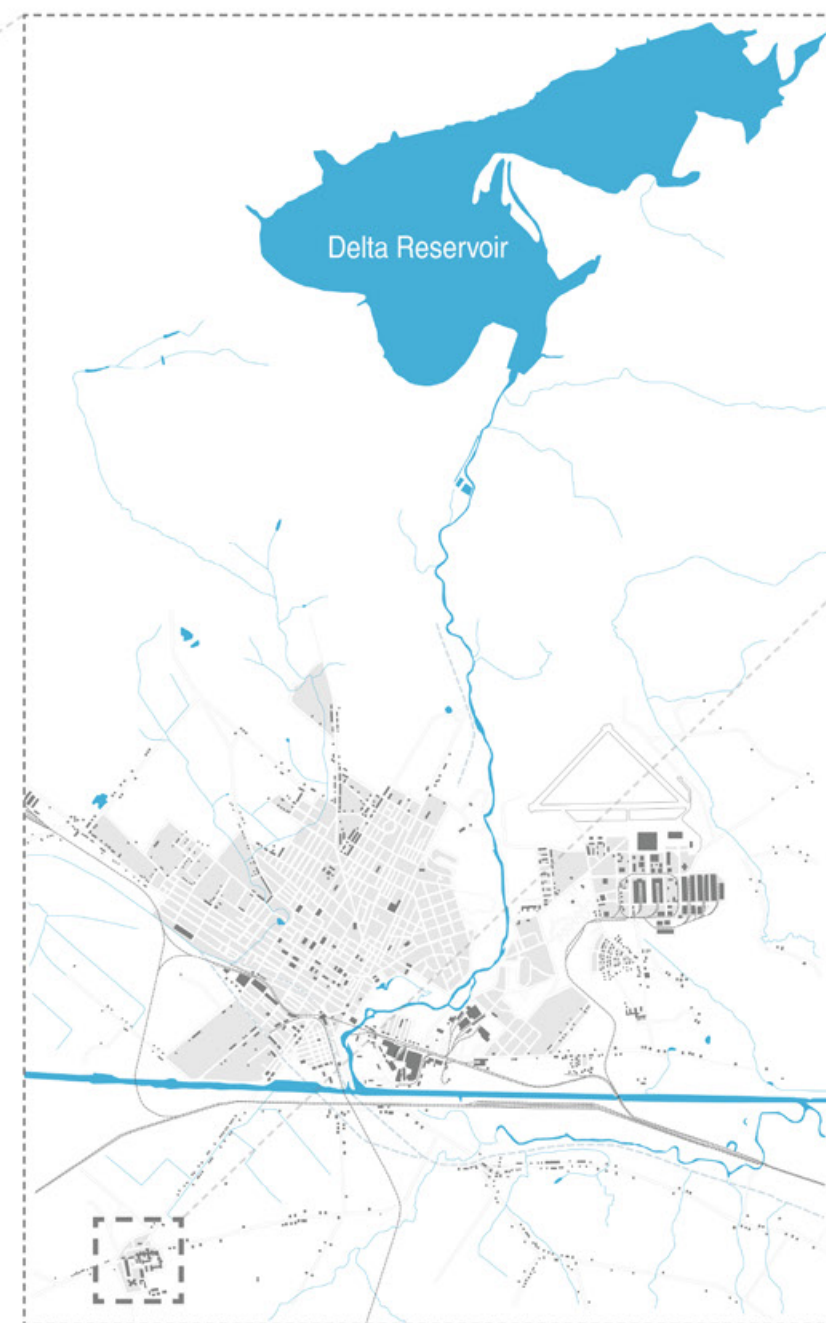
City in Oneida County, NY
Population: 33,725 (2010)
Known as the "Copper City"
Historical Industry: Metal Industries
(Mining & Manufacturing)
First Settlement: 1796
Incorporated: 1870

Status: Closed
Security Level: Medium
Years in Operation: 23
Open Year (as Prison): 1988
Close Year: 2011
Capacity: 998 beds
No. of Workers: 611

Erie Canal
- the Water Exostructure as Driver of Urban Development

A poorhouse across the firt Erie Canal started its construction.

Timeline of Oneida's Development

Buiildings functioning as a poor farm and a custodial asylum began its constrcution, later named as the Rome State School.

The Rome State School forced industrial training and re-education of the so-called 'un-teachable idiots.' Many staff violences have been reported.

Oneida Correctional Facility opened on the group of the previous State School, a medium faciliy, it houses 998 men along with 611 empoylees.

Rome population has been in decline since 1980s

1817   1893   1920   1988   2011 **ONEIDA CLOSED DOWN**

Delta Reservior

Delta Reservior

Timeline of Rome's Growth

1817
1st Erie Canal built

1874
2nd Erie Canal built

1917
3rd Erie Barge Canal built

In order to fill the new canal with enough water, a reservior was constructed on top of the town of Delta, displacing hundreds of residents and two cemeteries.

1959
Erie Canal stopped commerical freight operation

2022
Delta Reservior floods into Erie Canal annually

Mapping Urban Development
-Parallels in growth around Water Exostructure

Flood Risk in Rome, 2022

Approx. 813 properties have a 5% chance of some amount of water reaching their building in 2022.

properties
120
80
40
0

0   1   2   3
Depth of flooding (feet)

Points of homes, roads, businesses and services at risk in Rome. Rome is currently considered to have a major risk of flooding over the next 30 years.

minor   moderate   major   severe   extreme
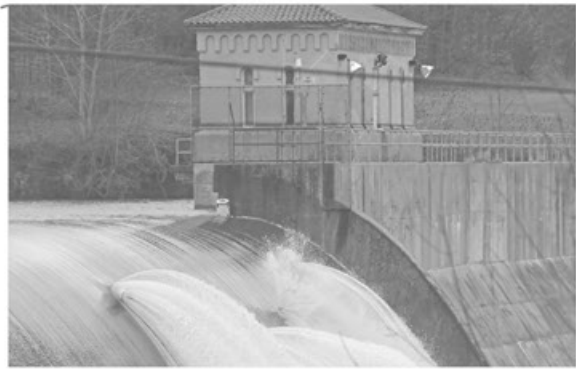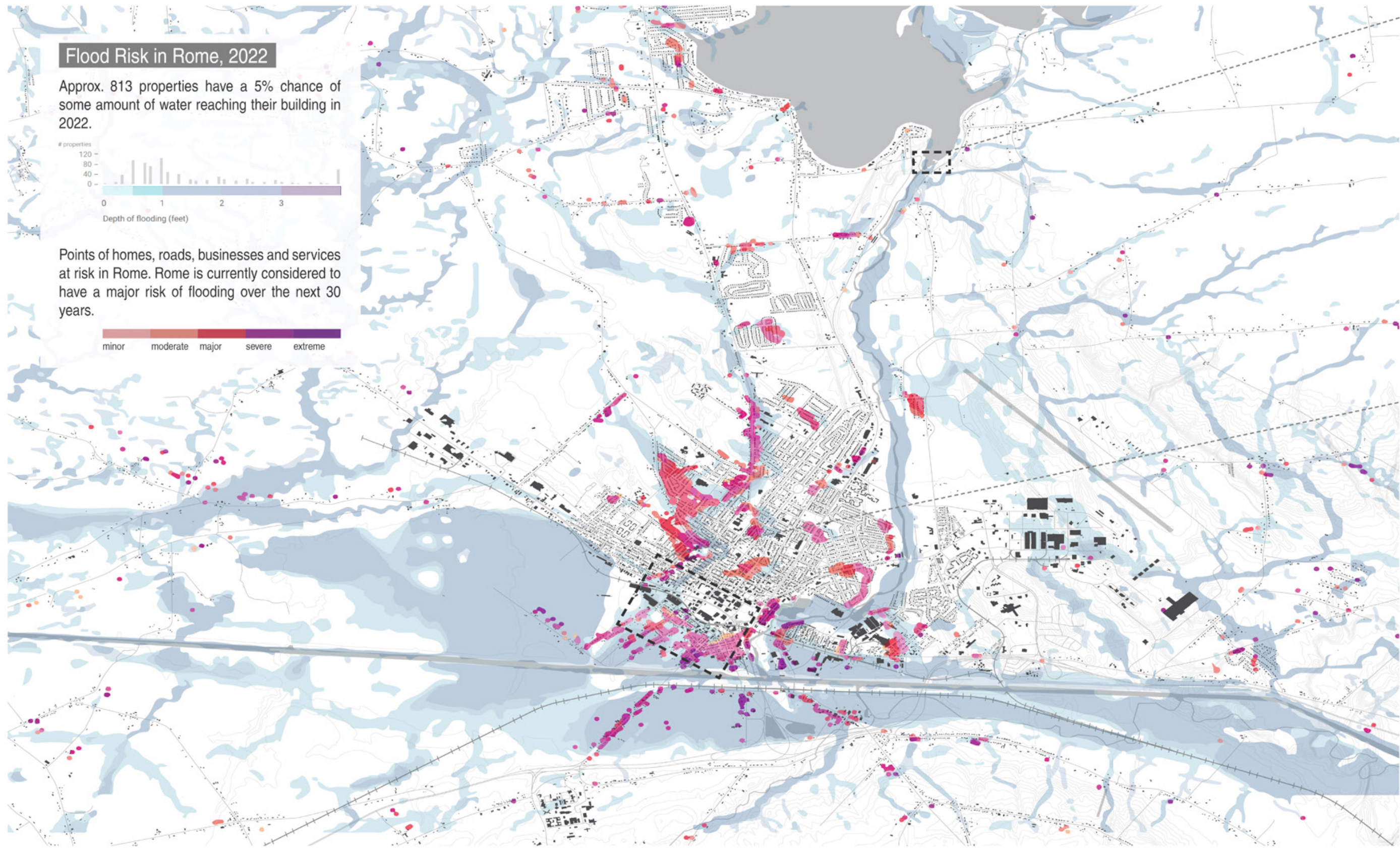
Currently Rome is considered to have a major risk of flooding. Where 14% of all properties in the city have more than 26% chances of being severely affected by flooding over the next 30 years. Every summer, water overfloods the Delta Reservoir and surges down into Downtown Rome.

Mapping Urban Development
-Parallels in growth around Water Exostructure

HARD-EDGE CITY

Equity

Ecology

Public Gatherings

'SOFT-EDGE' CITY

Flooding

Activities

Mental Wellbeing

Community

Main Drives of 'Soft-Edge' Rome
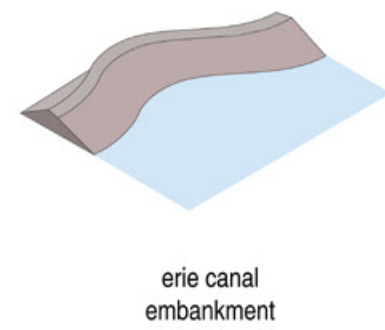
erie canal
embankment

art event
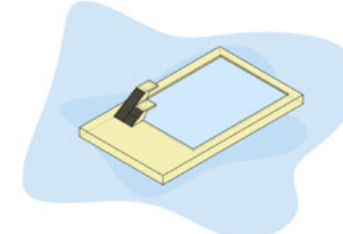
flood pool
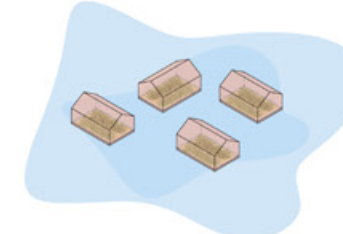
floating green
house

pond/ river
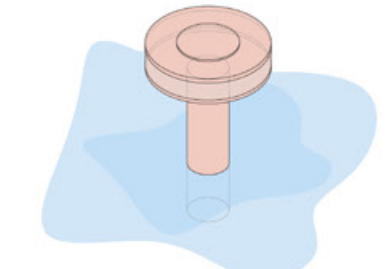
flood monitoring
station
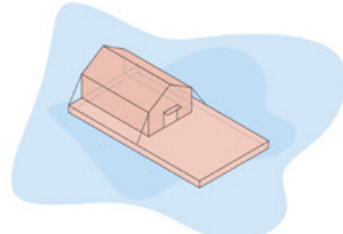
emergency
shelter
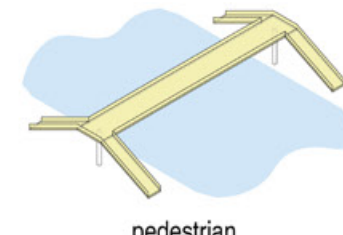
pedestrian
bridge
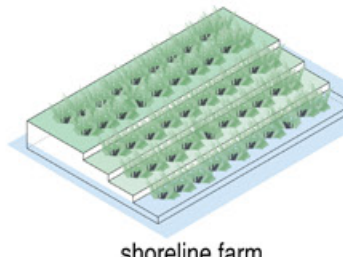
shoreline farm
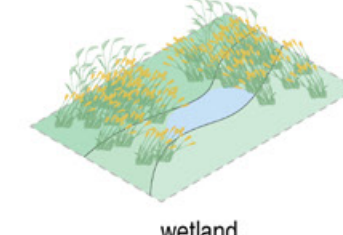
wetland
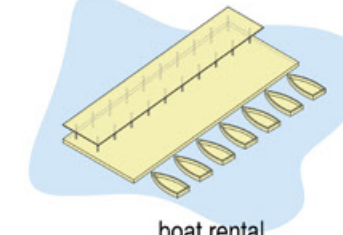
boat rental

resillience learning
center
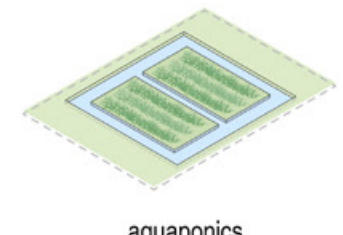
aquaponics
farming
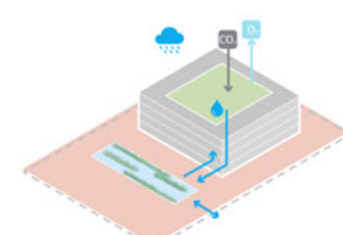
rain water
collector tank
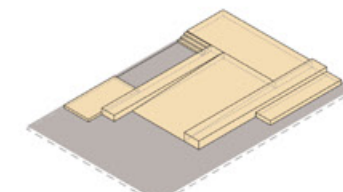
public square

park
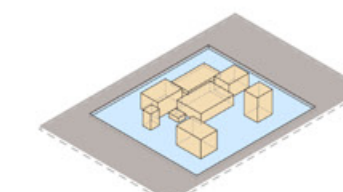
water square

botanical
garden
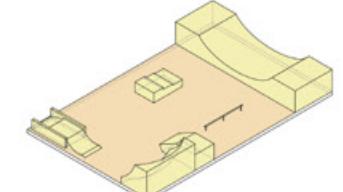
skate park
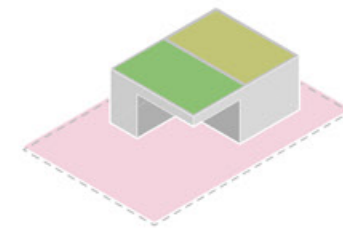
community
health center
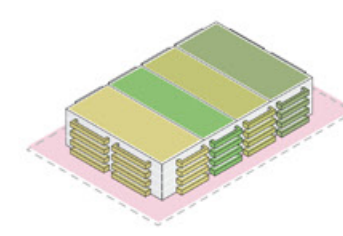
green residential
block
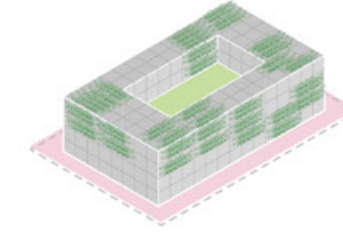
green industry
park
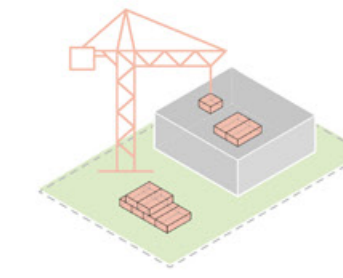
recycle center
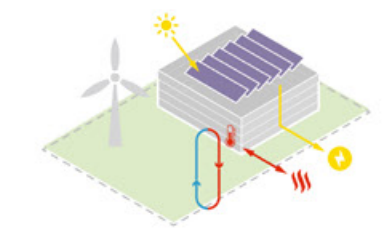
renewable energy
center
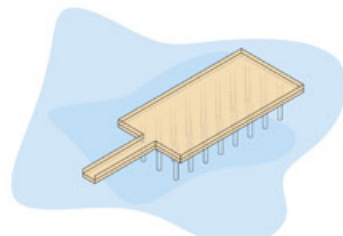
piers

forest
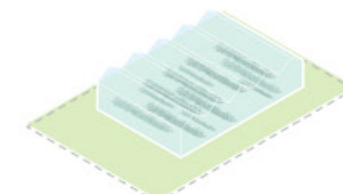
plants nursery

urban houses
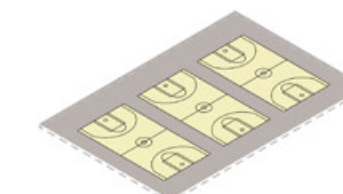
sports field
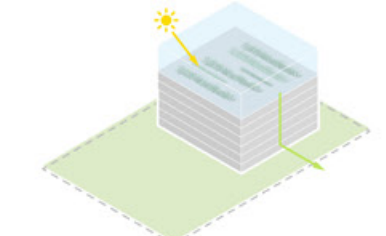
roof garden
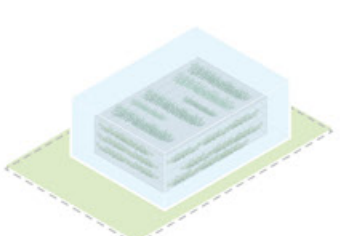
green house

Transformative Programs
-Plug-ins Along New Edges
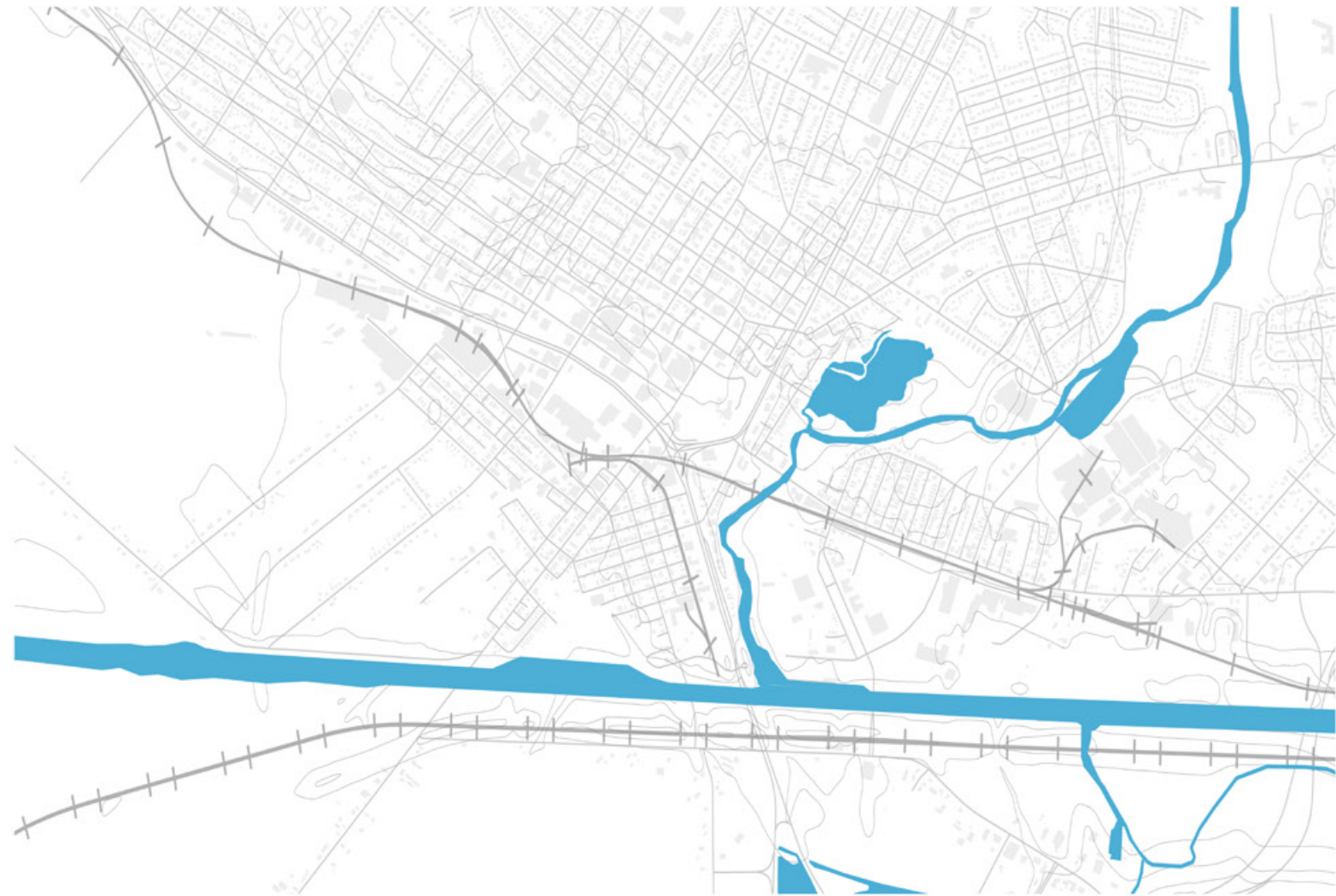
Current hard-edged drawn water front of Rome
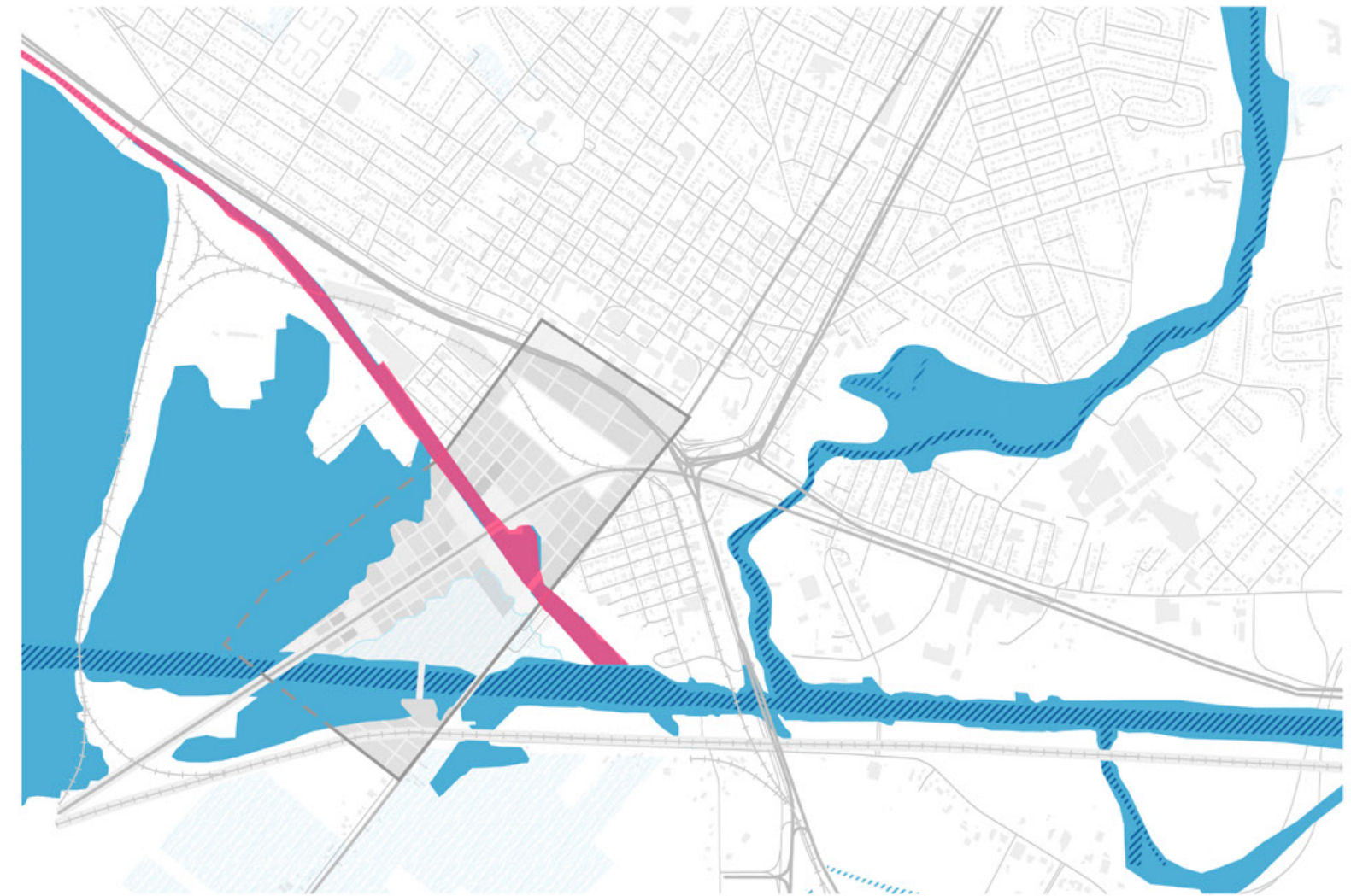
Proposed new soft-edged zone in the most flood-prone area in Rome

New Adoptive Edge of Rome
-Flood reclaiming 1st Erie Canal

44   45
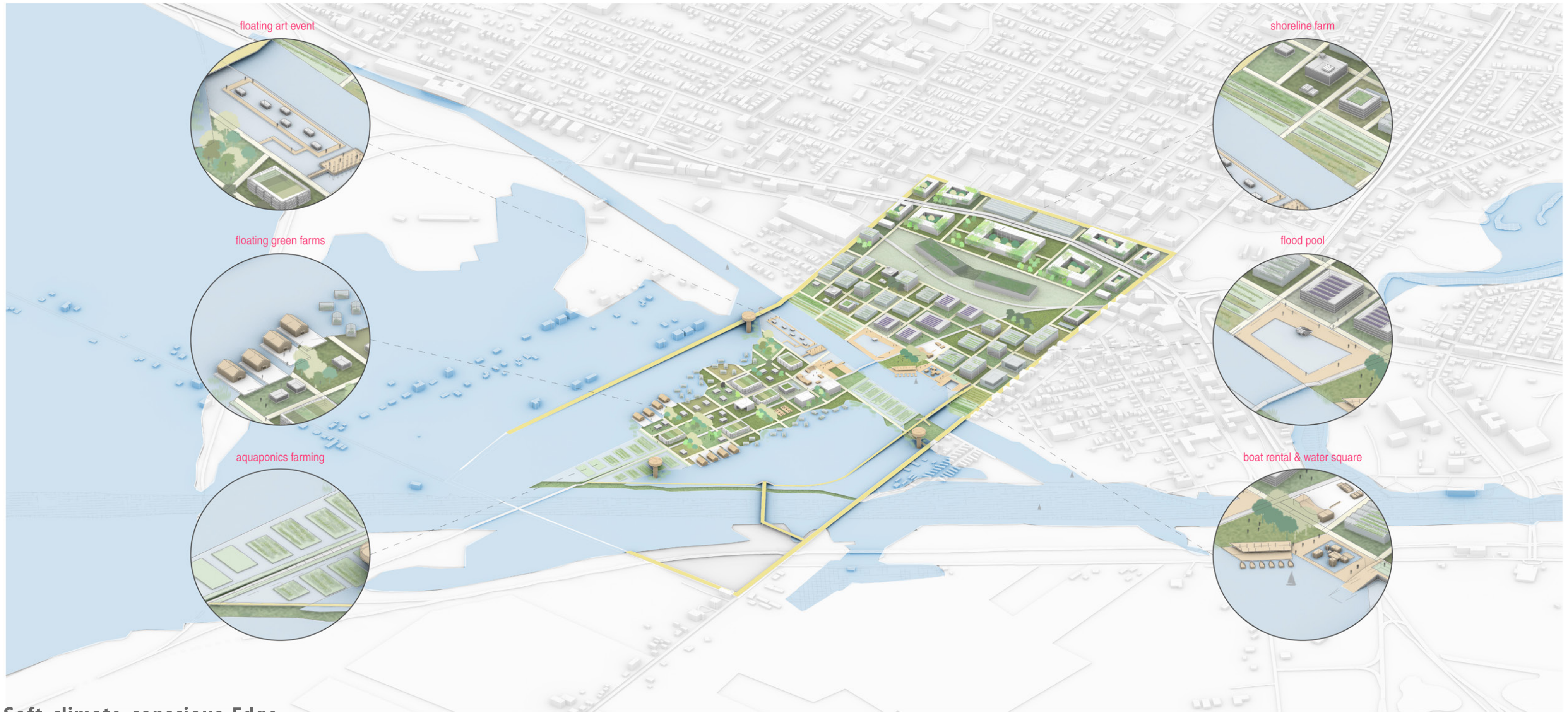
floating art event

shoreline farm

floating green farms

flood pool

aquaponics farming

boat rental & water square

Soft-climate-conscious-Edge
-Re-engaging Erie Canal as the economic driver of Rome

Transscalarities

Progression without context:
ON PARQUE BIBLIOTECA ESPAÑA

Before 2015, when ascending uphill through line K of the Metro cable car, three black polyhedrons stand over Medellín's Santo Domingo Savio, "folded and clipped" like the contours of its mountain site, its edgy geometry perched atop the undulating landscape of the favela's makeshift red bricks and concrete slabs. But now, the Parque Biblioteca España has remained walled-up, its facade stripped and its cores wrapped in black fabric. Labeled as Medellin's "white elephant" by locals, it had failed to meet its promised goal, which is to provide "long-term social rejuvenation" to the community.

Following the footsteps of Bogota, Medellin started developing a social master plan in the late 1990s. Since 2003, led by Mayor Fajardo, the city has been experiencing a construction boom of public buildings and infrastructure, concentrated primarily in poorer neighborhoods. To "bringing opportunity to the lower classes, and draw business and tourism," for which it has employed many accomplished designers. In 2005, Giancarlo Mazzanti, based in Bogota, was commissioned by the city government to designed the project, which he has envisioned with the intention of "urban, cultural and social transformation."

Donated by and named after the country of Spain, the library's three architectural volumes house a series of public amenities, including a library, classrooms, exhibition hall, auditorium, and office space. Its volumes are joined by an expansive public balcony that overlooks the city and is surrounded by an open forecourt intended for participatory community events. Four million dollars and half a block of houses dismantled later, the finalization of the construction was done to meet the deadline of the opening. Streets paved in a single night; workers worked against the clock to race before the inauguration , which the King of Spain attended along with then-Mayor Sergio Fajardo and the project architect Mazzanti.

Outside acknowledgments flooded in: MoMA acquired the original model of the library; winning the VI Latin American Architecture Biennale ; getting approval from the Guardian for its effort to "make poverty visible" ; Iñaki Ábalos recounts Medellín's "triumphal creation of public space." Likewise, Justin McGuirk's Radical Cities reflects on the collaborative efforts of architects combating violence to reunite the city's citizens. But failures began to appear in 2013. It turns out both the facade system and concrete quality were not built to the specification and standards. This resulted in inadequate waterproofing, and slate plates started falling off when it rained. After closure in October 2015, its been under reconstruction, which would result in another three million dollars.

It turns out the poor construction quality was not directly linked to the architectural approach and the major's office and architect firm have been suing the corrupted contractor. But why constructing something so grandiose and expensive that did not suit the local construction reality in the first place? Considering the local commuña have already been operating autonomously, with existing community leaders that cosigns to every decision made. It turns out the project administration has never asked the community for opinions and was instead a pure political publicity stunt. This becomes more evident when Mazzanti talks about how the interior "could de-contextualize the individual from the poverty that is experienced outside," and "we wanted to take people from this poor community into another place and change their reality." His intention resulted in a dramatic externality, a design that is only "photogenic" in the short run- to be visible from afar with its black slate facade and distinct shape- to become a political monument.

"Lots of people want to know what's going on with this space," the 20-year-old Jhon says in the documentary Biblioteca España sí... pero no así, "We can't lose it. It's a place where people can learn. It's not just a library, it's a place that represents the future of the neighborhood."

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Ábalos, I. (2011). Latin American architecture today. Harvard Design Magazine: Architectures of Latin America, 34, 16-23.

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Broome, Beth. (2011) A Landmark Acquisition for MoMA's Architecture and Design Department. Architectural Record RSS, Architectural Record, www.architecturalrecord. com/articles/2370-a-landmark-acquisition-for-moma-s-architecture-and-design- department.

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Bornacelly, Jaime. (2015) Biblioteca España Sí... Pero No Así. Estudios Socioespaciales, de la Universidad de Antioquia, https://narracciones.org/contenidos/ biblioteca-espana-no-asi/.
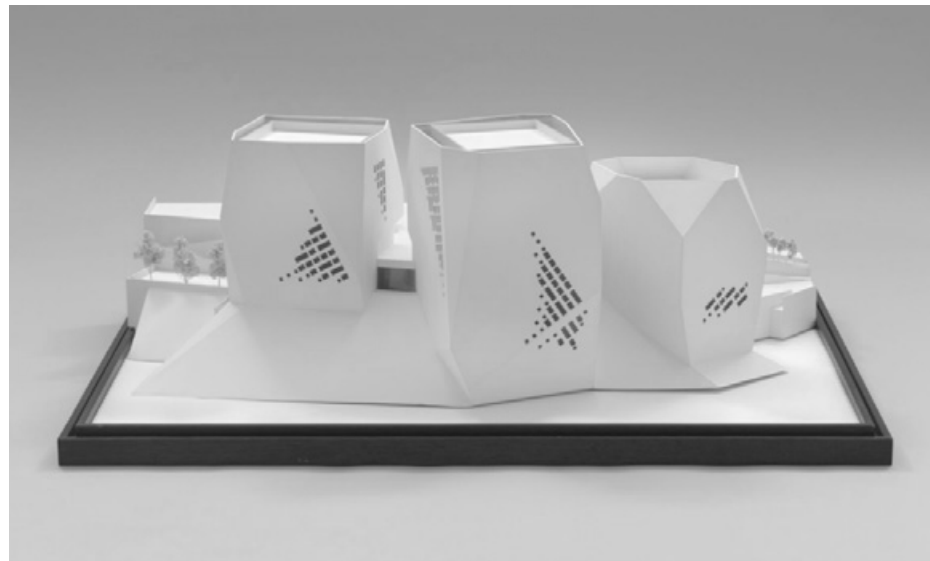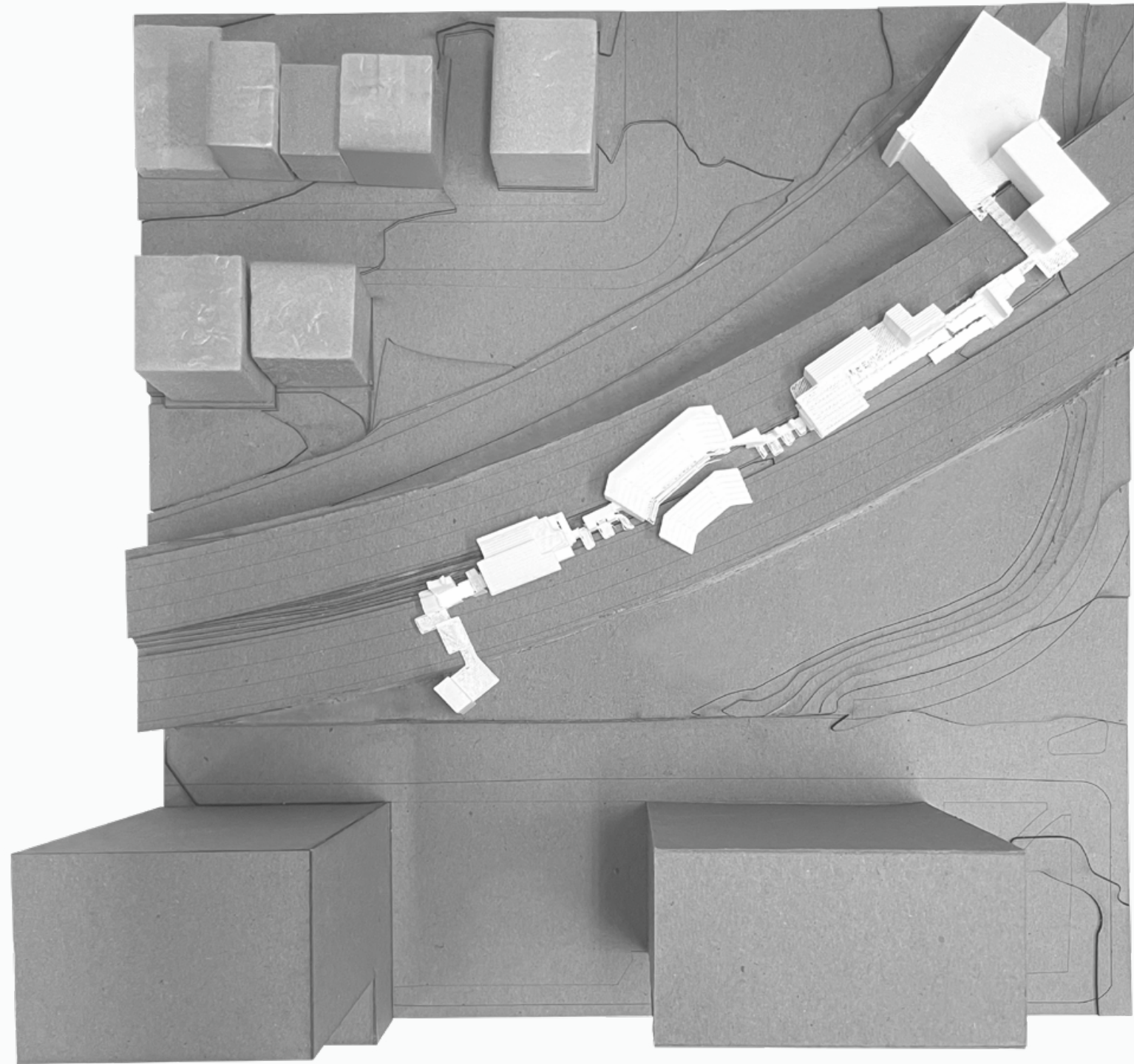
05

Circular Market Street
THICKENED IN-BETWEEN

The construction of the BQE has historically established a division and segregation among communities. It has created inaccessibility among the trench next to cobble hill, and also made the view from the promenade at brooklyn height a part of the privilege of the local residents. 20 mins is the average time people spend commuting for food and groceries, the site has a projection that connects to these communities that have a high level of food insecurity, namely Columbia street waterfront, Red Hook, downtown Brooklyn and Gowanus.

The project is located at the end of Brooklyn Bridge Park's pier six and sandwiched between Atlantic Avenue and Furman Street, acting as the receiving end of the newly occupied BQE. Because of the unique accessibility of the promenade to visitors from outside the Brooklyn height residents, this market street would act as a receiving end of visitors through public transportation and from Atlantic Avenue.

1.5M+

New Yorkers are struggling to feed themselves and their families right now— a 38% increase over pre-pandemic figures

1 in 3

Or more than 520,000 children in New York City are experiencing food insecurity—a 64% increase over pre-pandemic figures

21.5M+

Visits to NYC soup kitchens and food pantries since the start of our pandemic response in March 2020— a 46% increase over pre-pandemic figures
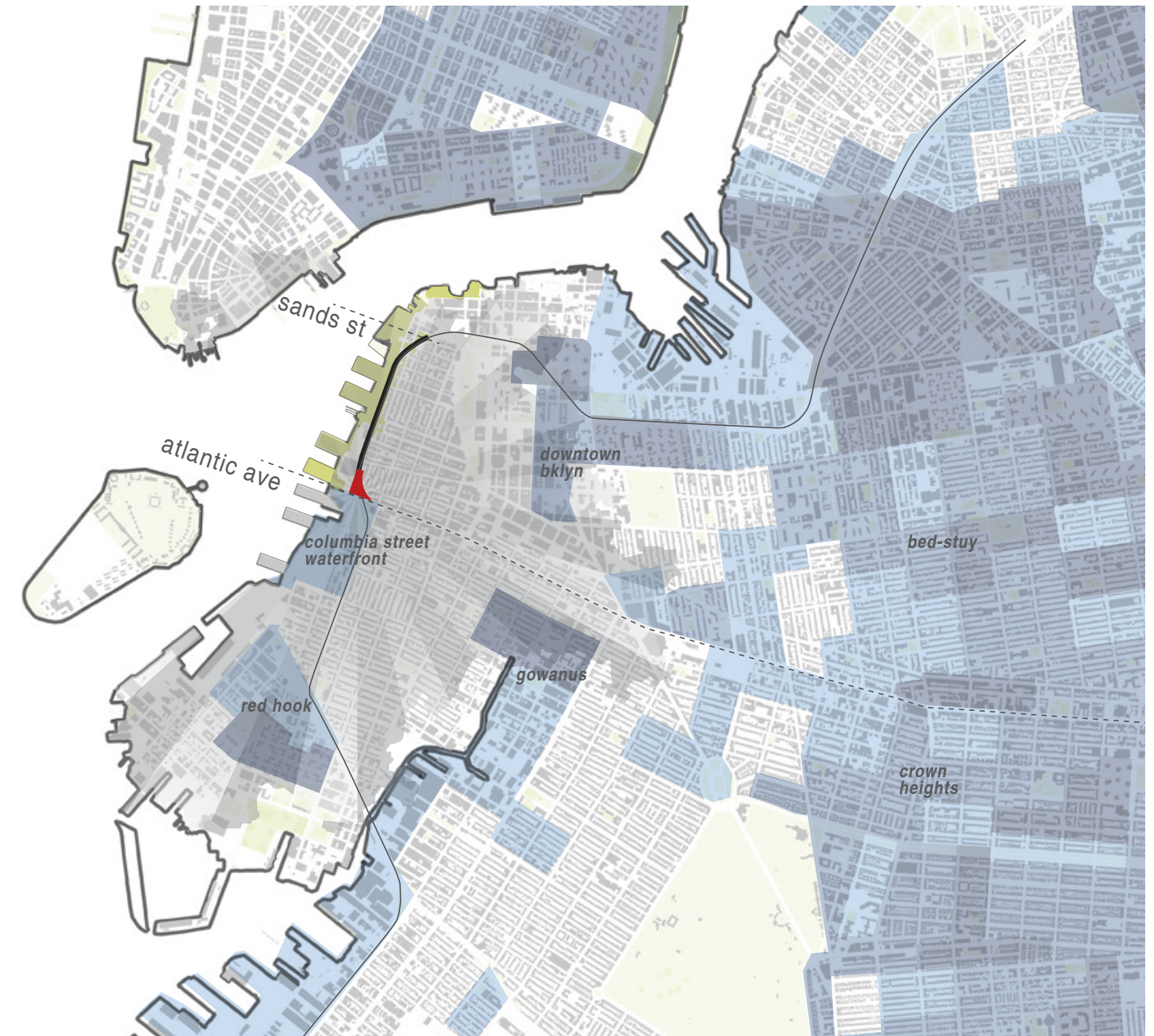
Food Insecurity Rate NYC, 2021

sands st

atlantic ave

columbia street waterfront

downtown bklyn

bed-stuy

gowanus

red hook

crown heights

	20 min transit
	site
	18-54%
	14-18%
	11-14%
	BQE
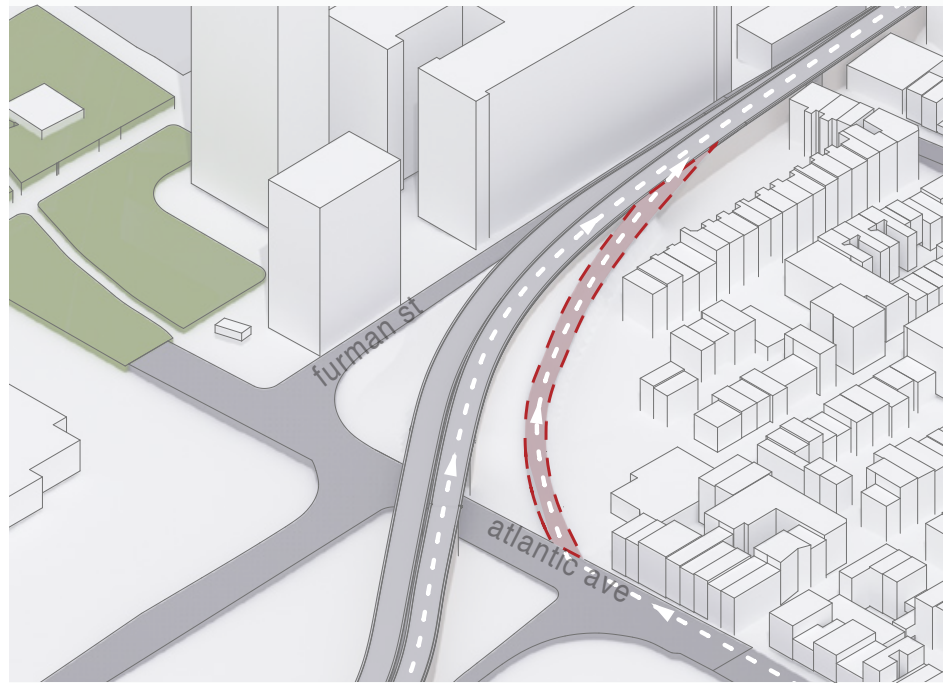
Current On-Ramp Route At Atlantic Ave Intersection
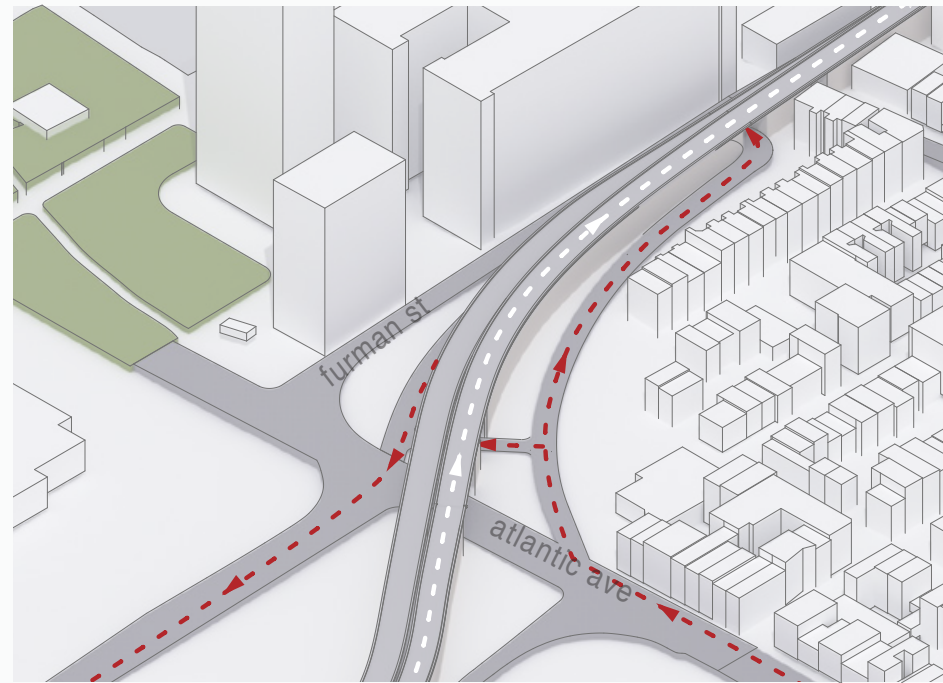
Proposing Re-Routing Under Atlantic Ave Intersection Bridge

sands st

brooklyn bridge park

atlantic ave

Site As Access Point of Brooklyn Bridge Park

site
access route
subway stops
bus stops
BQE

Traditional Supermarket typology

CONTAINER TRUCKS → REFRIGERATED TRUCKS →

SORTING & STORAGE & LOADING

SUPERMARKET

LOCAL DISTRIBUTION

IN-PERSON SHOPPERS
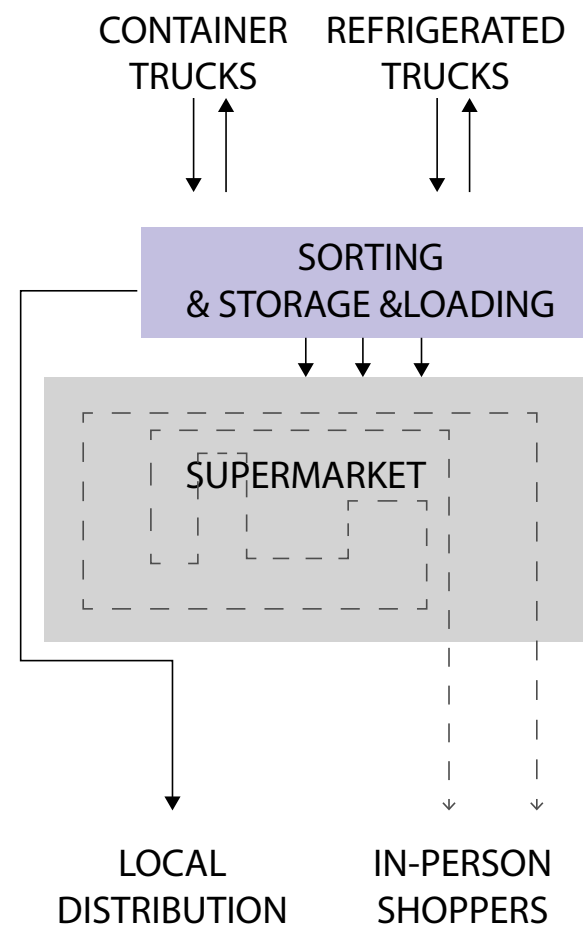
Traditional Supermarket typology

European/Asian market typology

FREIGHT TRUCKS

LOADING DOCK

FOOD/PRODUCE STALLS

COMMERCIAL STOREFRONTS

IN-PERSON SHOPPERS
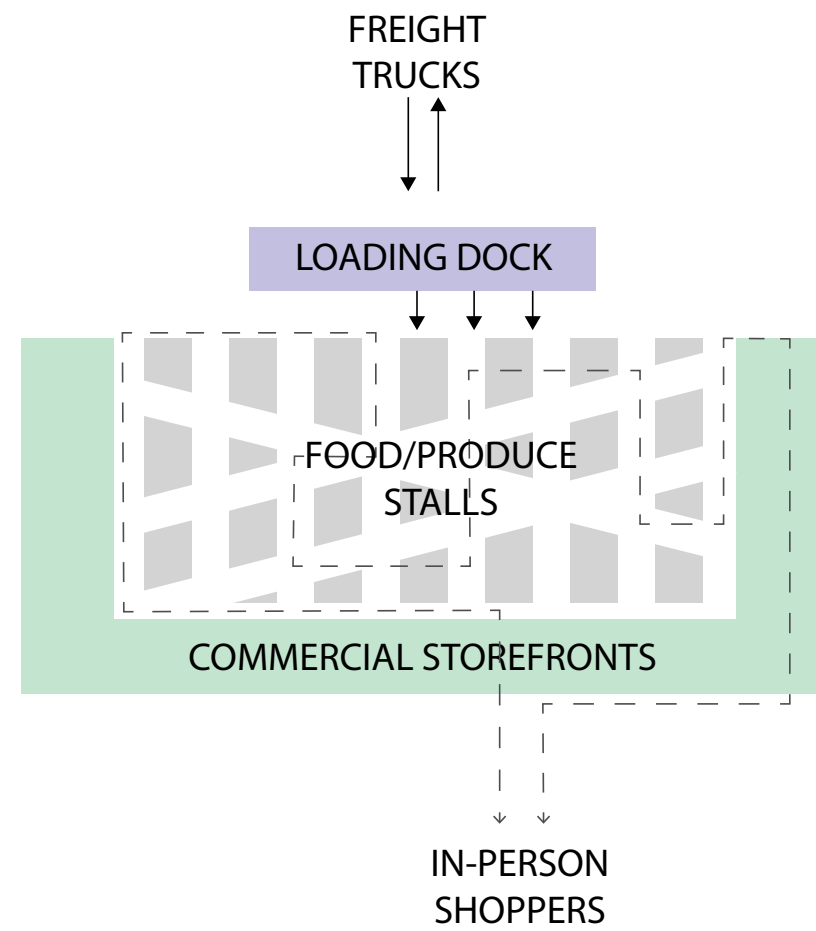
European/Asian market typology

Circular market typology

LOADING DOCK

FREIGHT TRUCKS

BBP VISITORS

STORAGE & SORTING

BH RESIDENTS

DINING

FOOD/PRODUCE STALLS

donate

FREIGHT TRUCKS

FREIGHT TRUCKS

COMPOST

FOOD BANK

COMMUNITIES IN NEED
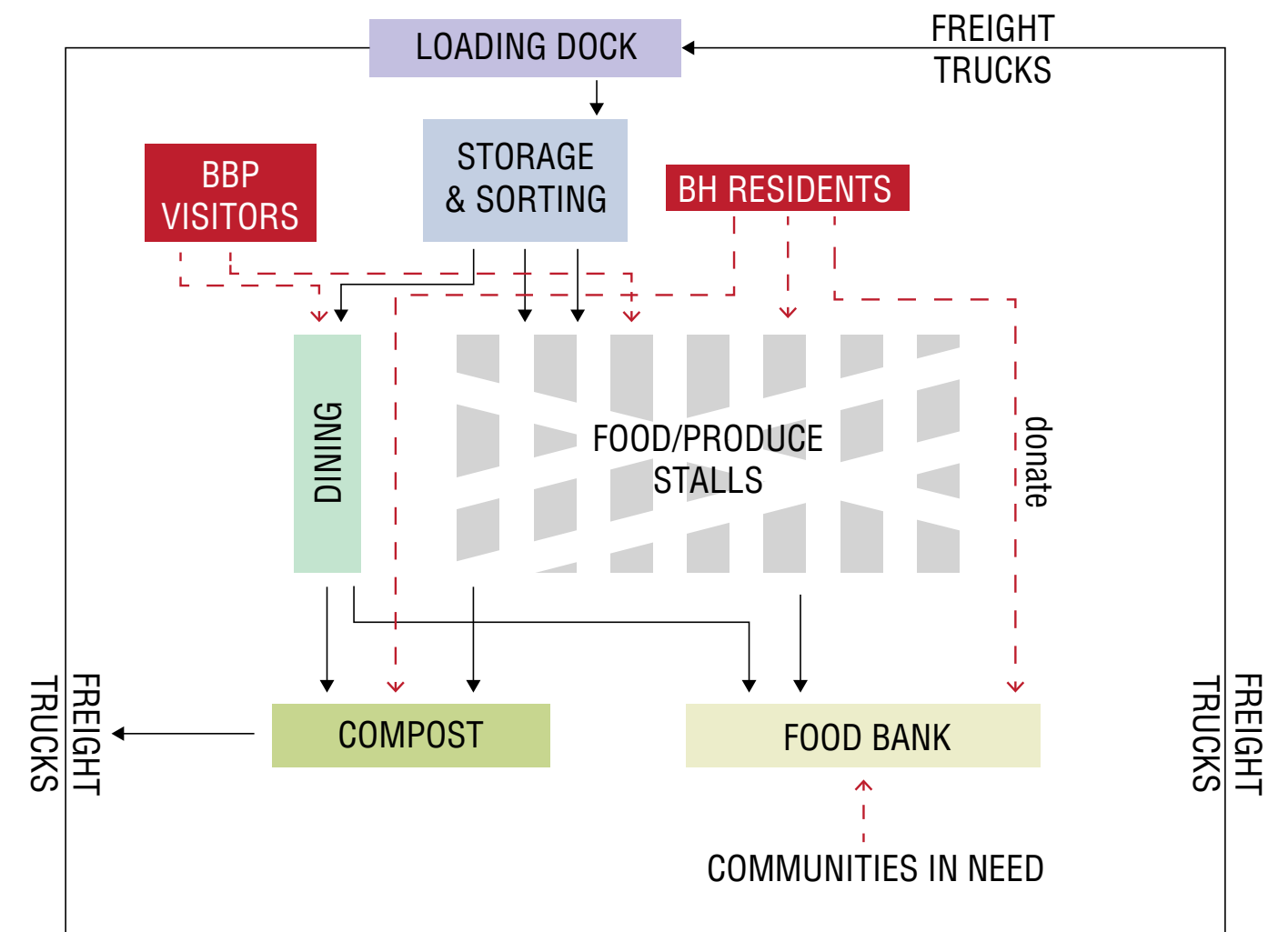
Circular market typology
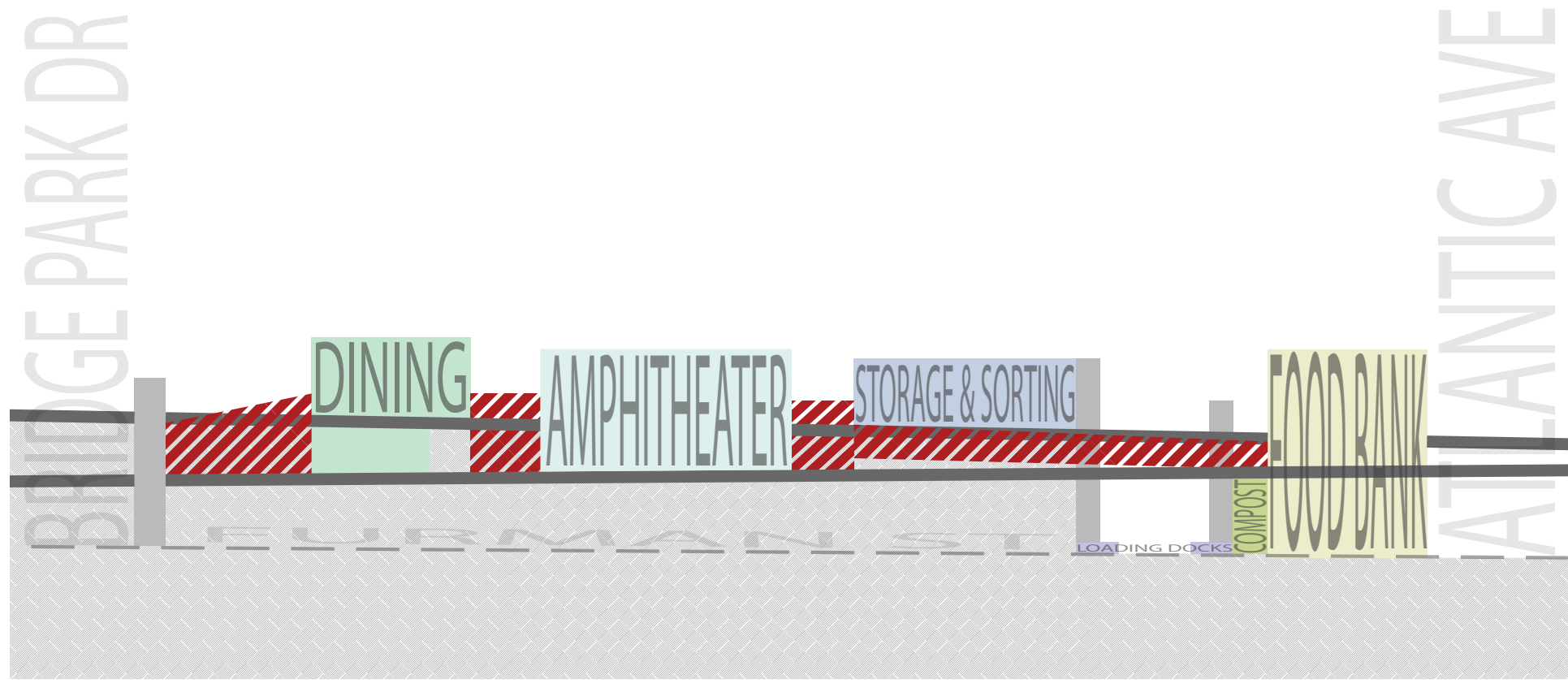
Diagram Section
Bridge Park Dr. to Atlantic Ave.

DINING

AMPHITHEATER

STORAGE & SORTING

FOOD BANK

COMPOST

LOADING DOCKS

BRIDGE PARK DR

ATLANTIC AVE

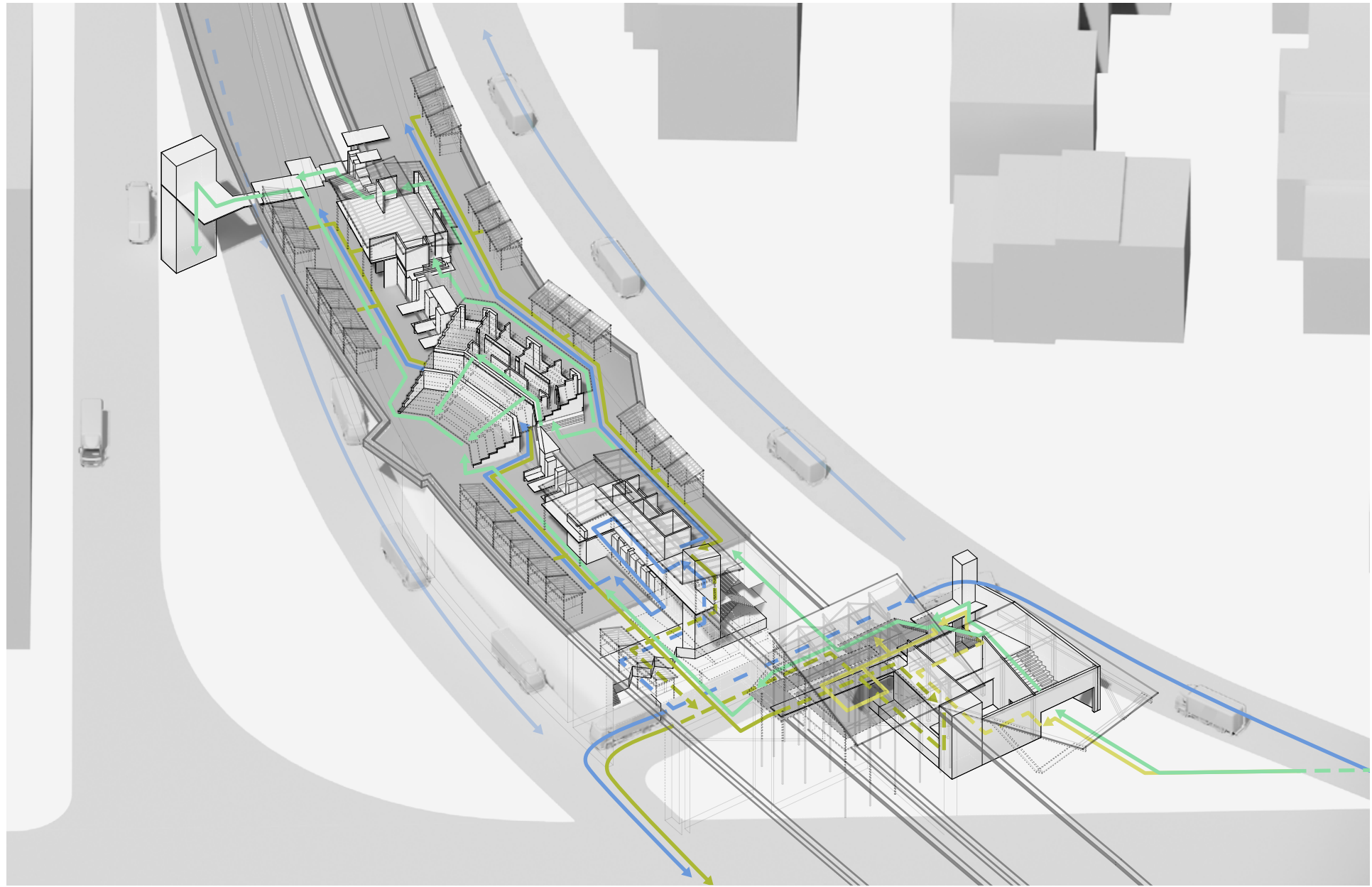LEURMAN ST
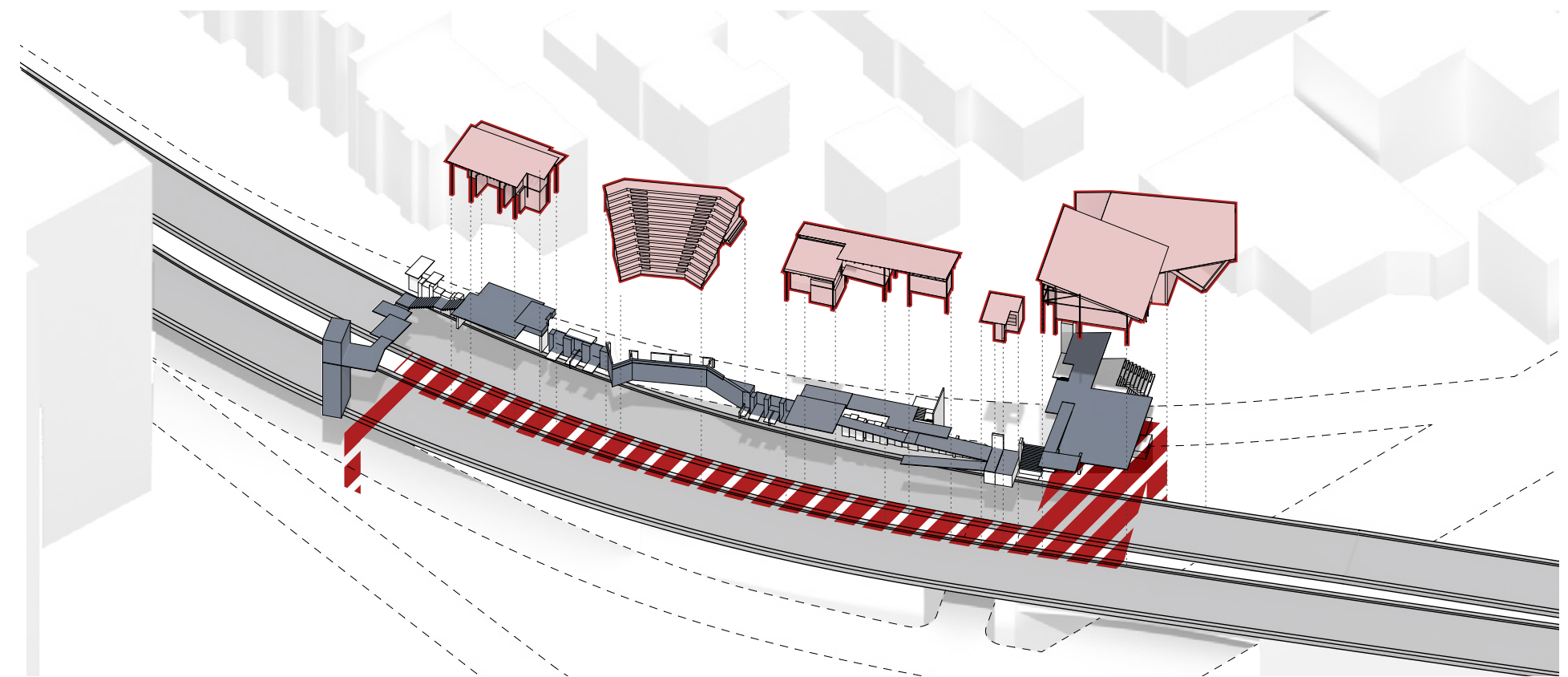
Plug-ins on the Highway
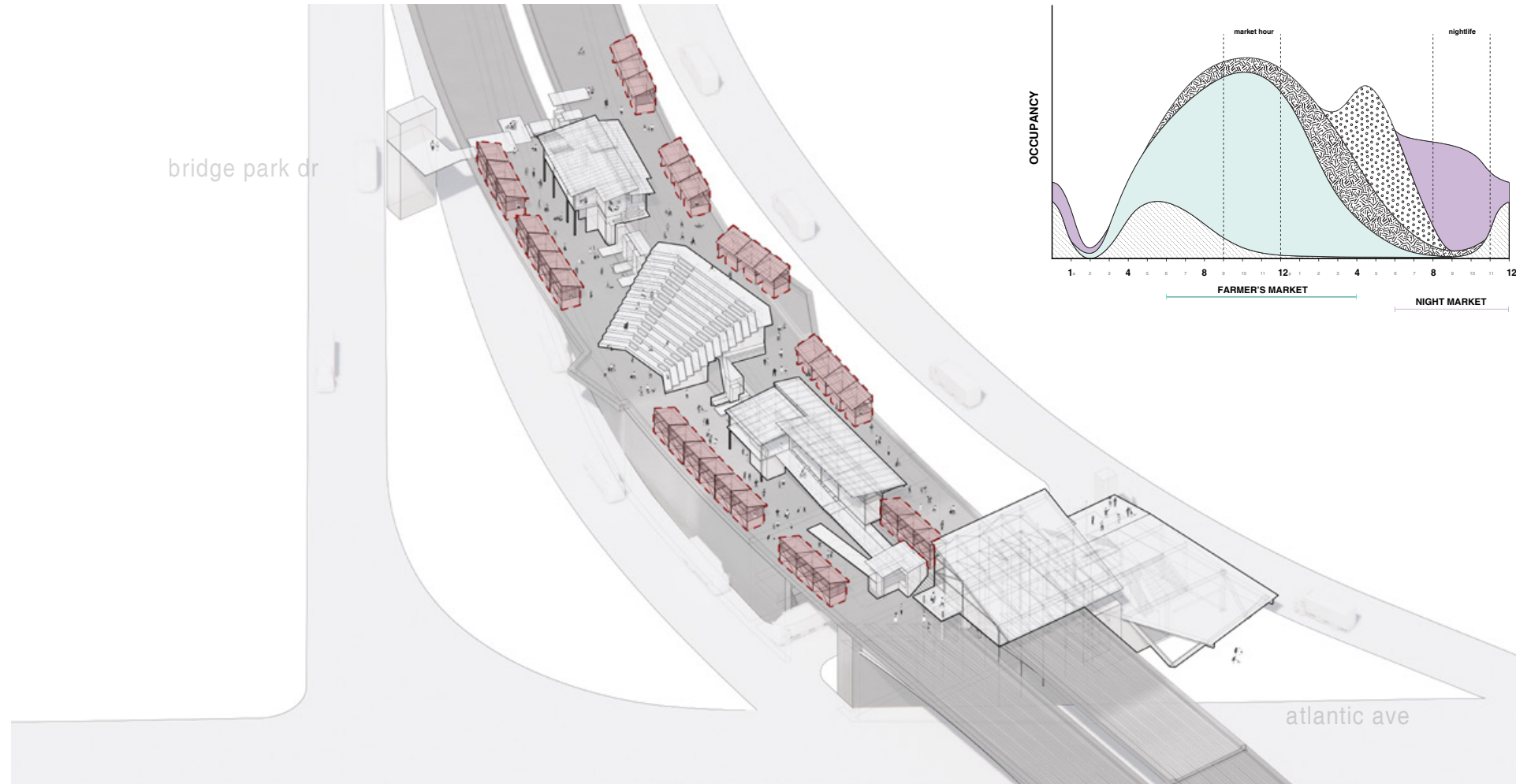
Market Street Occupancy   *with move-able market stalls*
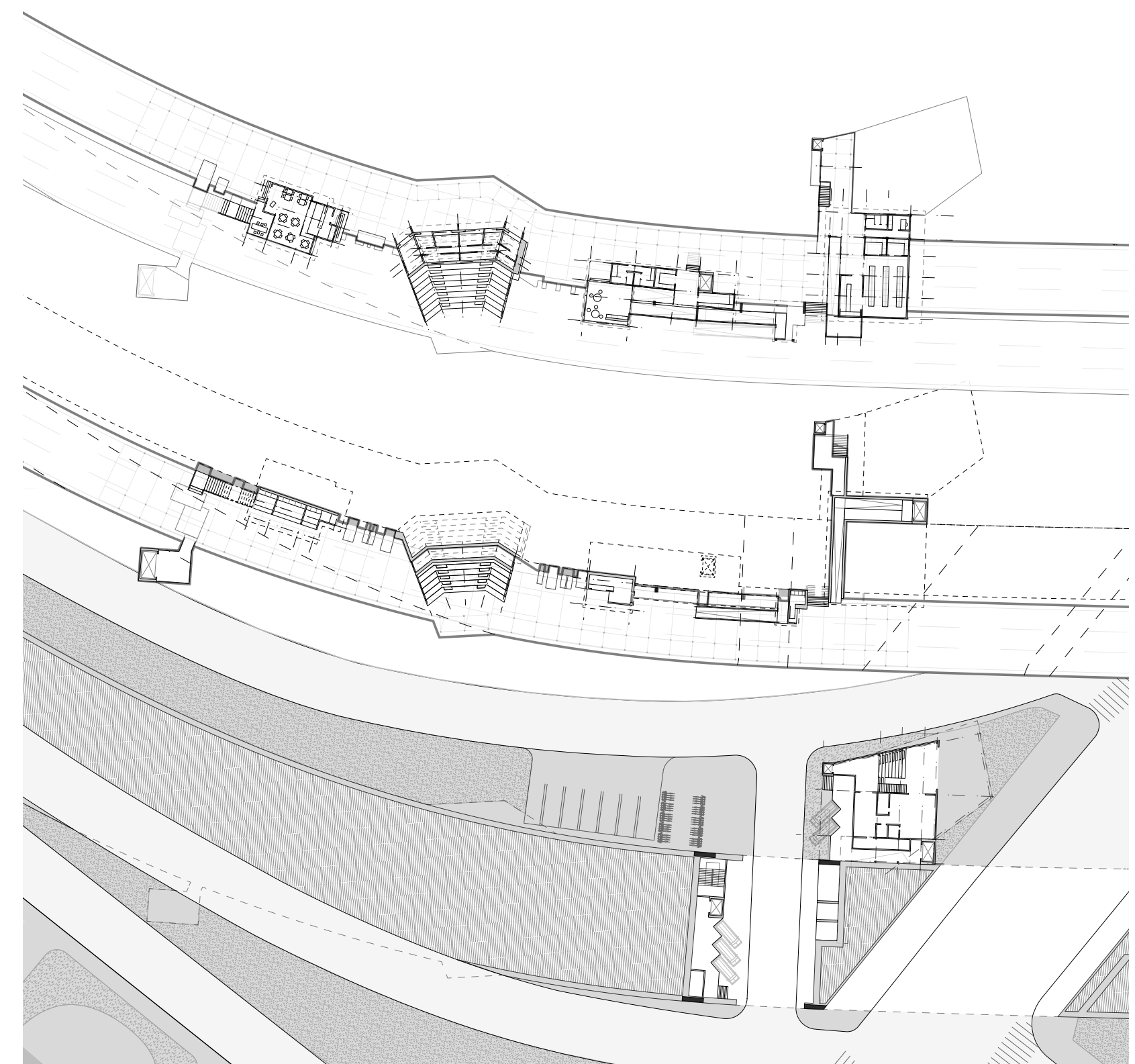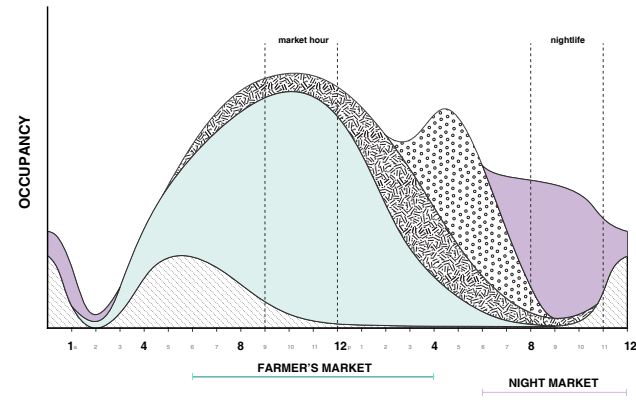
2nd Level Plan

1st Level Plan

Ground Plan

Freight Circulations
Visitors Circulations
Food Bank Circulations
Waste and Compost Circulations

Permanent & Temp Hut

Distribution Center

A Celebration in the Slum:
ON THE DESIGN MUSEUM DHARAVI

How do we draw attention to poverty without dismantling and naturalizing its existing urban fabric? The Design Museum Dharavi responds to this question by posing itself as a celebratory medium that promotes the creative potential of the homegrown neighborhood in Mumbai, India—founded by Spanish artist Jorge Mañes Rubio, Dutch curators Amanda Pinatih and alongside more than 50 local artisans in the community. This small mobile museum first opened in February 2016 and traveled to different locations every two months to display and later give back everything from pottery and textiles to recycled items created within the locality. The whole museum is compactable and is designed to fit inside a caravan that could operate like one- running on literal wheels.

Dharavi is a locality in Mumbai, India. It is Asia's second-largest slum. An area of just 3 square kilometers, it has a population of about 1 million. With a population density of over 277,136 per sqkm, it is considered one of the most densely populated areas in the world. In contrast, Tokyo only has a population density of 6,158 persons per square kilometer. In the heart of India's most prosperous city, Dharavi is located between two main train lines and only a few kilometers south of the new business district, the Bandra-Kurla Complex.

First occupied in 1883 during the British colonial era, Dharavi grew as polluting factories moved out by order of the then government. Rural Indians migrated to Mumbai, back then Bombay, searching for jobs. Despite the challenging conditions of their surroundings, the residences create, design, manufacture, and commercialize all kinds of goods. Tanneries, potteries, garment makers, and recycling facilities sprung up within Dharavi as the slum grew. As a result, 20,000 workshops, studios, and miniature factories make up the internal revenue of the locality, and it was reported to have an informal estimated GDP of close to $1 billion in 2019. Through its notoriety and complexity, it has been the backdrop of many Bollywood classics, from Deewaar (1975), Nayakan

(1987), Parinda (1989), Dharavi (1991), and Ram Gopal Varma's "Indian Gangster Trilogy" (1998–2005). Although in the West, Dharavi was most notably introduced to the public in the British film Slumdog Millionaire (2008), which made "slum tours" a popular attraction for westerners visiting Mumbai. It made headlines in 2019 when travelers voted Dharavi as the first choice among places they would visit in India. Although guided mainly by locals, these tours fail to create an actual connection between the visitors, and "poverty was ignored, denied, overlooked and romanticized, but moreover, it was depoliticized."

Despite being made up of thriving clusters of talented workers who have made Dharavi their home for generations, this neighborhood is still perceived as an eyesore by the Indian government, many Mumbaikars, and the rest of the world. The development surrounding the locality also bolstered the potential real estate land value. In 1999, the Indian cabinet approved a redevelopment plan to relocate the residents and transform the locality into a striving business hub. Companies worldwide have bid to redevelop Dharavi, including Lehman Brothers partnered with Foster and partners, Dubai's Limitless and Singapore's Capitaland Ltd. Nevertheless, the realization processes have remained unsuccessful for more than two decades, caused by the cost of relocation and general investment. In 2020, it was estimated to cost 31,000 crores (US$4.2 billion) to redevelop.

With a display of colorful chai cups and saucers, terracotta water filters, brooms and fans created by the local artisans, and cricket bats painted by the local cricket player to honor their team pride, the museum has become a ground for community dialogues and gatherings. The intervention was intended to display the regional artistic rendition of commercial products found in Dharavi to create "a platform for these products and their makers so that they can be recognized by the local community, the city of Mumbai and the rest of the world." Acting as a non-invasive intervention, an artistic institution, the museum is a successful example that draws attention to the lives of people who occupy the slums instead of erasing them with redevelopment or

romanticizing poverty. Rather than a museum that enclosed objects behind glasses, the displayed objects were used immediately in cricket tournaments or exchanged between visitors with other items. Despite only a year of operation, the Design Museum Dharavi has successfully brought international attention to the humanized perspective of the "slum" and it own Biennale, continuously posting local artistry online since 2013. It was a celebration of resilience and creativity in Dharavi, decorated by and for the people.

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Nisbett, M. (2017). Empowering the empowered? Slum tourism and the depoliticization of poverty. GEOFORUM. 85, 37-45. http://doi.org/10.1016/j.geoforum.2017.07.007

Rubio, J. (2016). Design Museum Dharavi, http://designmuseumdharavi.org/Design_Museum_Dharavi/Dharavi.html.

Yardley, J. (2011). In one SLUM, MISERY, work, politics and hope. The New York Times. https://www.nytimes.com/2011/12/29/world/asia/in-indian-slum-misery-work-politics-and-hope.html.

www.fosterandpartners.com, Foster + Partners (2008). Dharavi masterplan: Foster + Partners. Projects | Foster + Partners. https://www.fosterandpartners.com/projects/dharavi-masterplan/.

Mashian, S. (2018). Dharavi: When a Slum becomes a Goldmine (6 mins). Cornell Real Estate Review. https://blog.realestate.cornell.edu/2018/03/20/dharavi/.
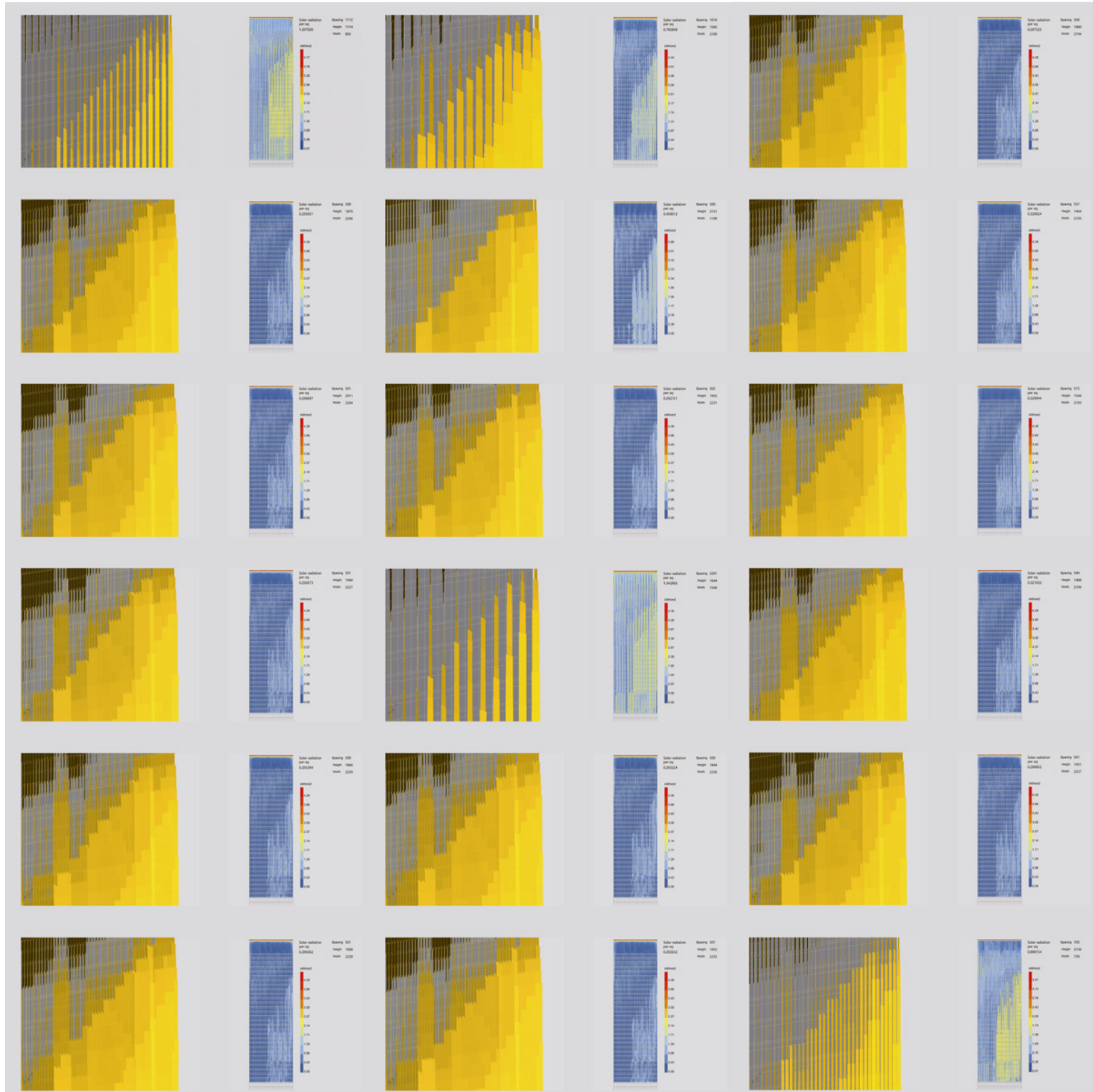
**Rethinking BIM**
TRANS-SOFTWARE PROCESSES

Tech Elective, Spring 2022
Columbia GSAPP
Instructor: Joe Brennan
Team: Yani Gao, Zihan Sun, Enfeng Xie

The project is an exercise in exploring different methods of leveraging BIM to enhance architectural design processes.

First, the historical yet outdated Seagram Building is constructed in Revit. Jan Zalasiewicz coined it as a 'techno-fossil' for the sheer material footprint the metal shell of the building took. While the building remains a fossil, the interior comfort level needs to depend on manual shading and cooling wholly.

We intended to design a value-engineered addition to the existing structure for the most efficient adjustment to the interior comfort level. Therefore we utilized multiple software- Rhino, Rhino Inside, Grasshopper Honeybee, Ladybug, and Revit- to analyze and design a strategy of additional mullion to adjust the solar radiation on the west facade.
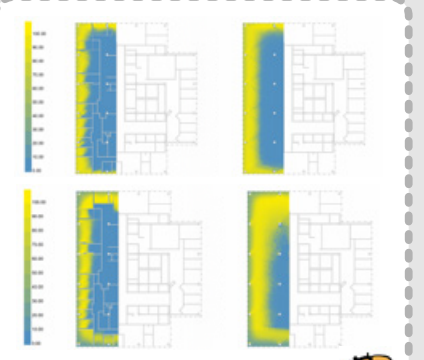
1. 3D Modeling
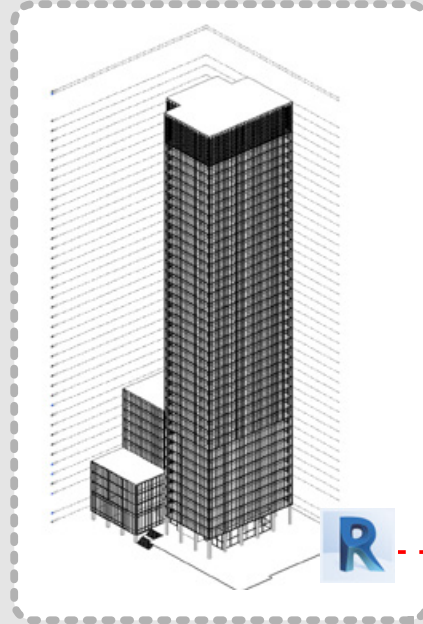
Rhino.Inside® .Revit

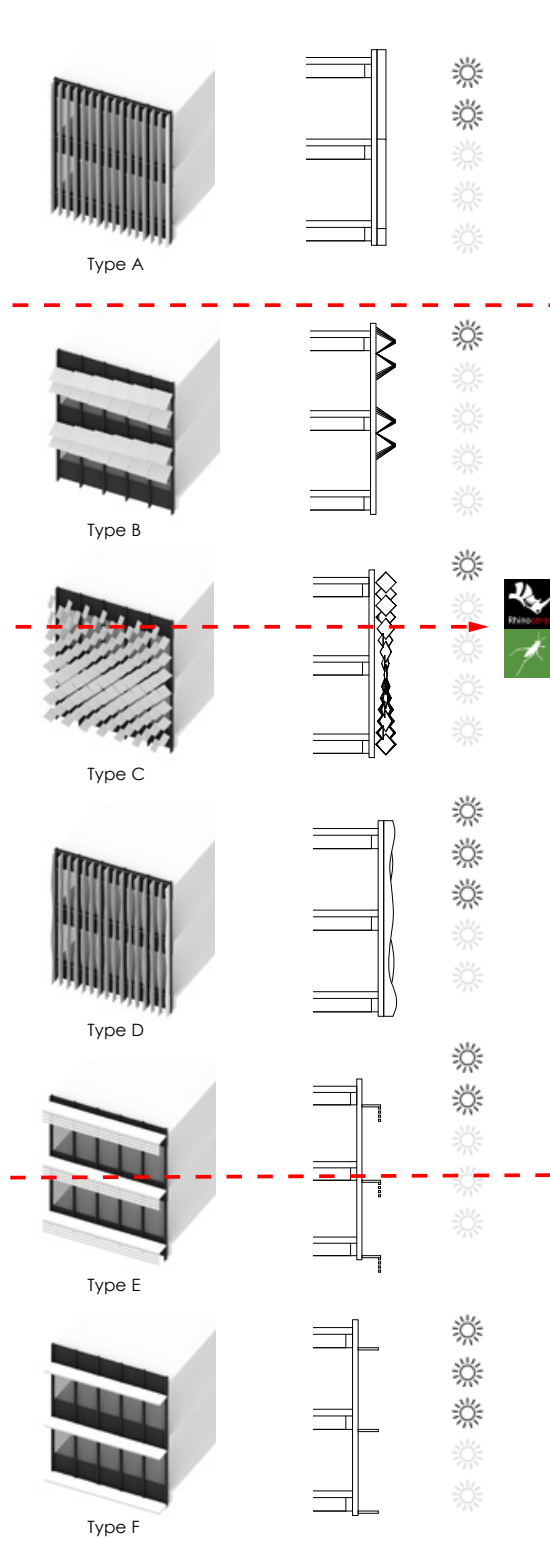# 2.1 Benchmarking Facade Solar Analysis

kWh/m2
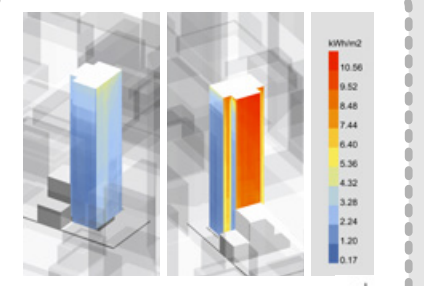
-Envelope Solar Radiation
Caculate Average Direct Sunlight
Hours on Selected Hours on 21st of
Every Month

# 2.2 Benchmarking Interior Daylighting Level

Interior Daylighting Analysis of
selected 11th & 38th floor plans

3. Examine Renovation Design Possibilities of West Facade

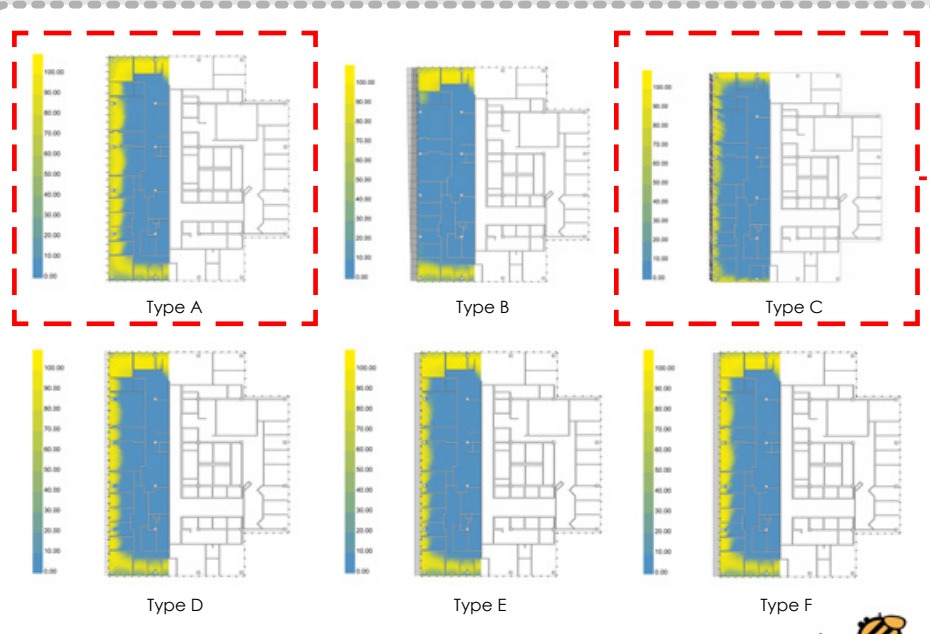Type A

Type B

Type C

Type D

Type E

Type F

Producing different re-designing angels for mass testing
- Horizontal Shading
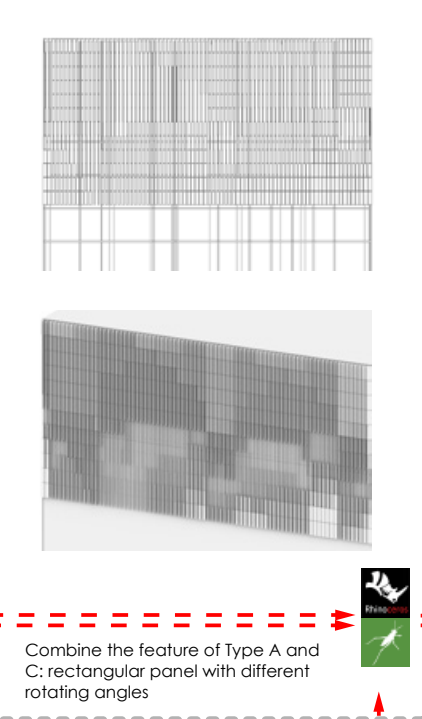- Vertical Shading
- Rotating Shading
- Hybrid Shading

4.1 Batch Testing for Solar Radiation Simulation Select Best Strategy

| Type A | Type B | Type C |
| Type D | Type E | Type F |
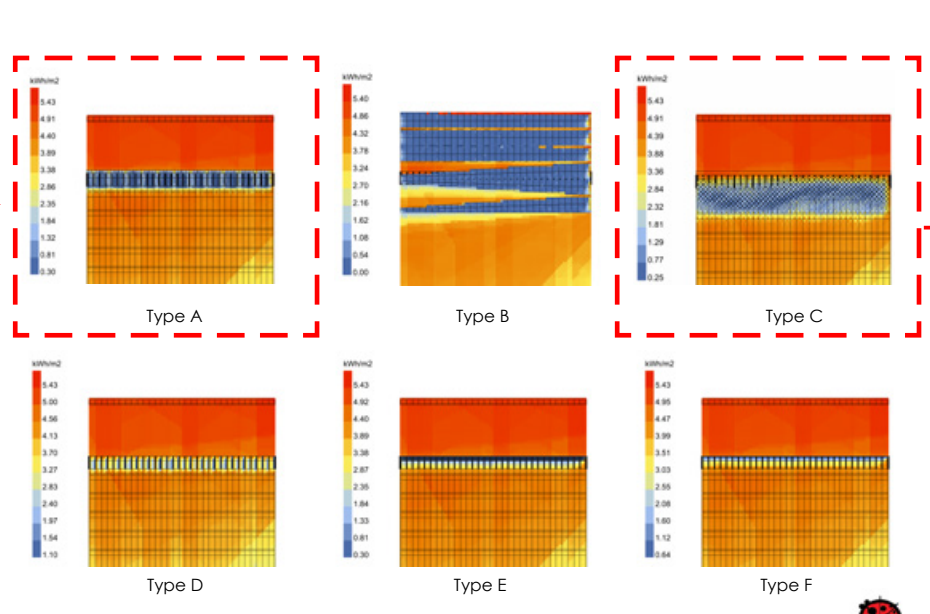
4.2 Batch Testing for Interior Daylighting Simulation Select Best Strategy

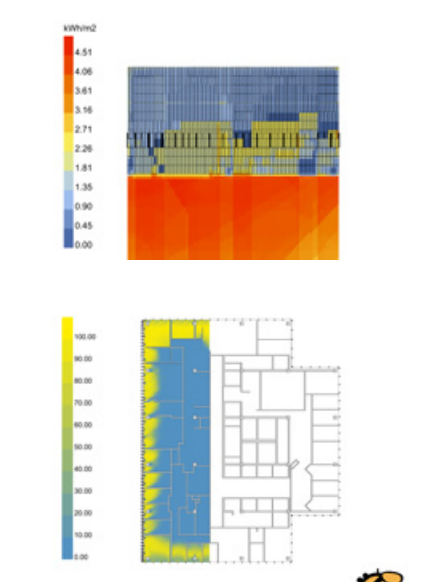| Type A | Type B | Type C |
| Type D | Type E | Type F |

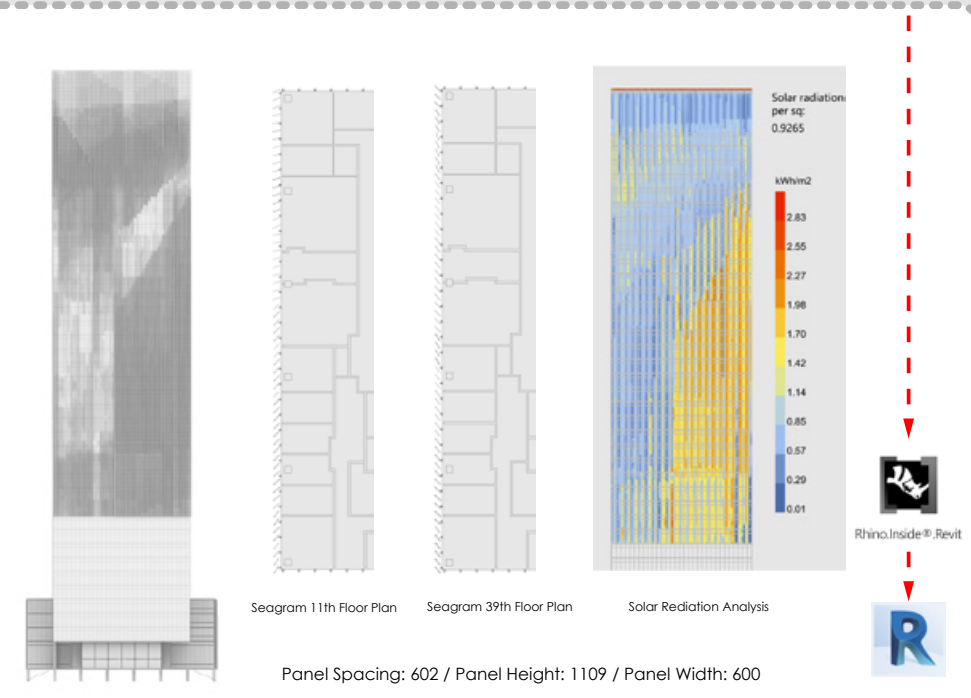# 5. Hybrid Selected Stratgies & Produce Design Iterations

Combine the feature of Type A and
C: rectangular panel with different
rotating angles
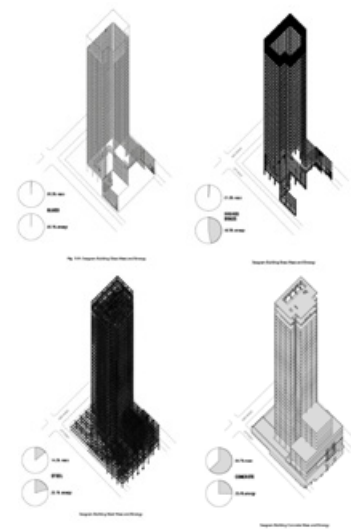
6. Evaluate & Improve Overall Performance
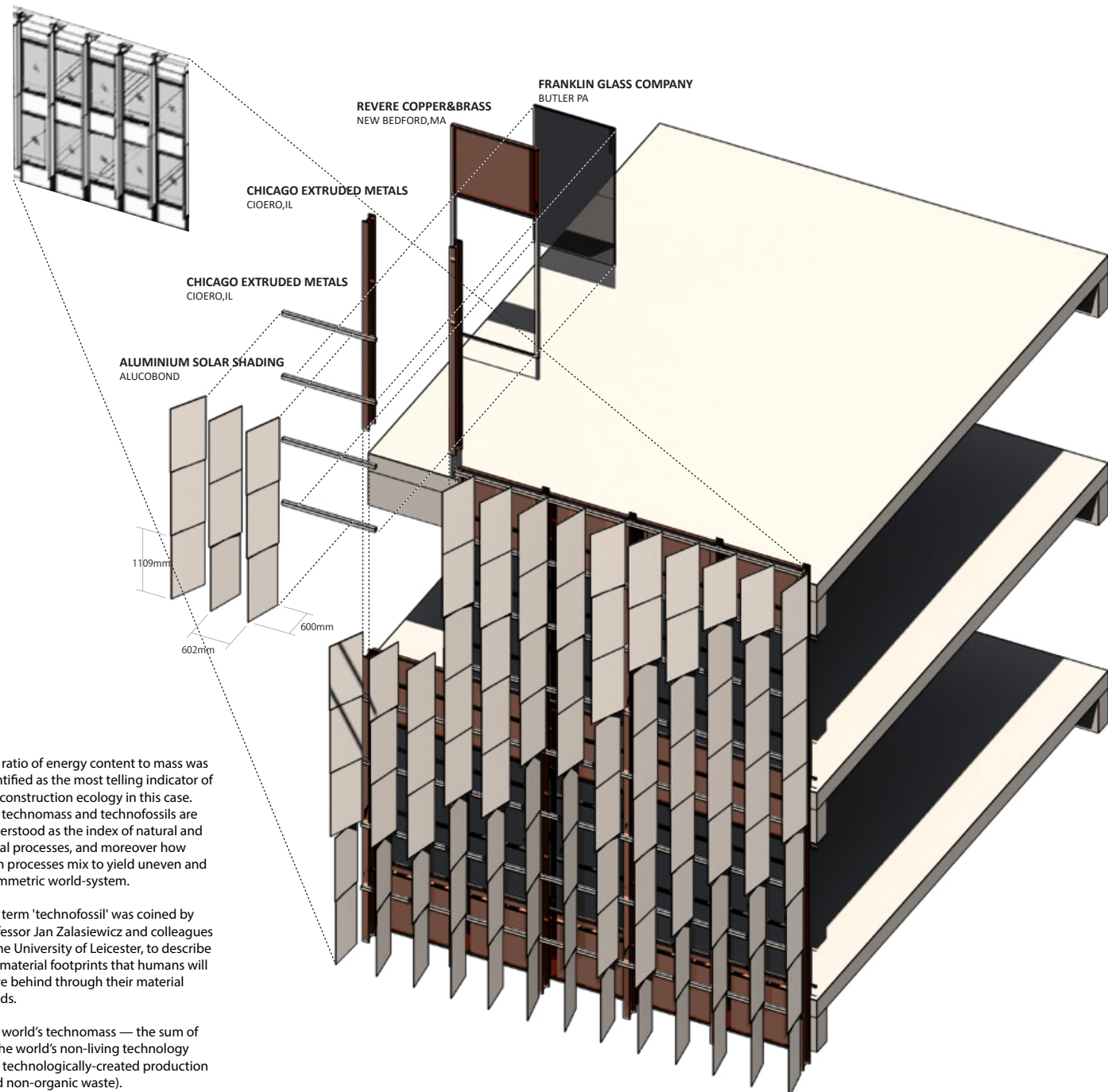

kWh/m2

7. Loop Optimization

8. Optimal Design Generated

Seagram 11th Floor Plan   Seagram 39th Floor Plan   Solar Rediation Analysis

Solar radiation
per sq:
0.9265

kWh/m2

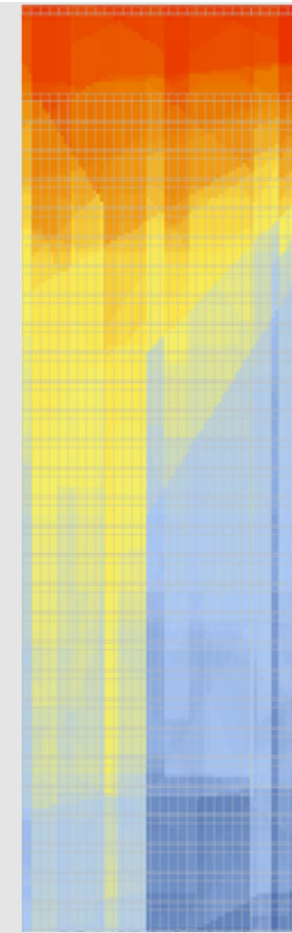Panel Spacing: 602 / Panel Height: 1109 / Panel Width: 600

Rhino.Inside®.Revit

Seagram building is a 515 feet (157m) tall skyscraper at 375 Park Ave., designed by Mies van der Rohe and Philipe Johnson.

Mies used non-structural bronze-toned I-beams to suggest structure instead. These are visible from the outside of the building, and run vertically, like mullions, surrounding the large glass windows. This method of construction using an interior reinforced concrete shell to support a larger non-structural edifice has since become common-place.

As designed, the building used 1,500 tons of bronze in its construction. On completion, the construction costs of Seagram made it the world's most expensive skyscraper at the time, due to the use of expensive, high-quality materials and lavish interior decoration including bronze, travertine, and marble. The interior was designed to assure cohesion with the external features, repeated in the glass and bronze furnish-ings and decorative scheme.

When the Seagram Building was completed, Lewis Mumford described the structure as a "Rolls-Royce" of buildings and wrote "it has the aesthetic impact that only a unified work of art carried through with-out paltry compromises can have."

Another interesting feature of the Seagram Building is the window blinds. One aspect of a façade which Mies disliked, was the disordered irregularity when window blinds are drawn. To reduce this dispropor-tionate appearance, Mies specified window blinds which only operat-ed in three positions – fully open, halfway open/closed, or fully closed.

FRANKLIN GLASS COMPANY
BUTLER PA

REVERE COPPER&BRASS
NEW BEDFORD,MA

CHICAGO EXTRUDED METALS
CIOERO,IL

CHICAGO EXTRUDED METALS
CIOERO,IL

ALUMINIUM SOLAR SHADING
ALUCOBOND

1109mm

600mm

602mm

The ratio of energy content to mass was identified as the most telling indicator of the construction ecology in this case. The technomass and technofossils are understood as the index of natural and social processes, and moreover how such processes mix to yield uneven and asymmetric world-system.

The term 'technofossil' was coined by Professor Jan Zalasiewicz and colleagues at the University of Leicester, to describe the material footprints that humans will leave behind through their material goods.

The world's technomass — the sum of all the world's non-living technology and technologically-created production (and non-organic waste).

Solar radiation
per sq:
3.331562

kWh/m2

5.43
5.06
4.70
4.33
3.97
3.60
3.23
2.87
2.50
2.14
1.77

Solar radiation
per sq:
0.9265

kWh/m2

2.83
2.55
2.27
1.98
1.70
1.42
1.14
0.85
0.57
0.29
0.01

Solar Radiation Analysis
without Optimal Shading

Solar Radiation Analysis
with Optimal Shading

According to the solar radiation analysis of existing Seagram Building, a additive layer of andulating mullions is extended from the west facade to reduce the amount of direct solar radiation gain.

West Elevation
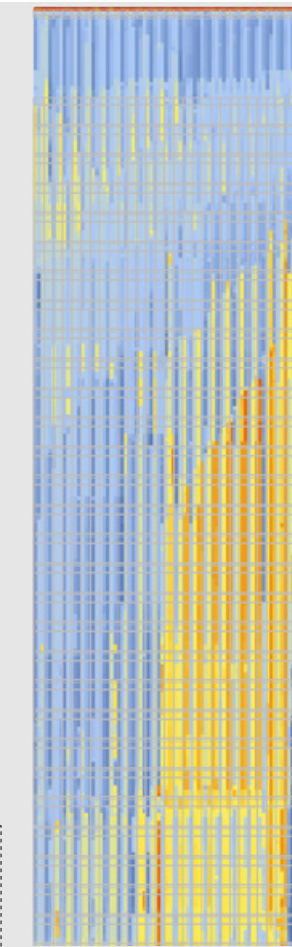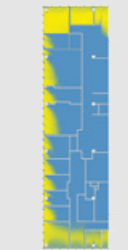
Daylight illuminance Analysis
with Optimal Shading

"MANI·FOLD"
II
Bodies of Water